THE
JOHN CRERAR
LIBRARY

The REFINER
AND NATURAL GASOLINE MANUFACTURER

JOHN CRERAR LIBRARY
APR 4 1927

JENKINS CRACKING PROCESS

PRODUCES QUALITY GASOLINE

Facts from performance

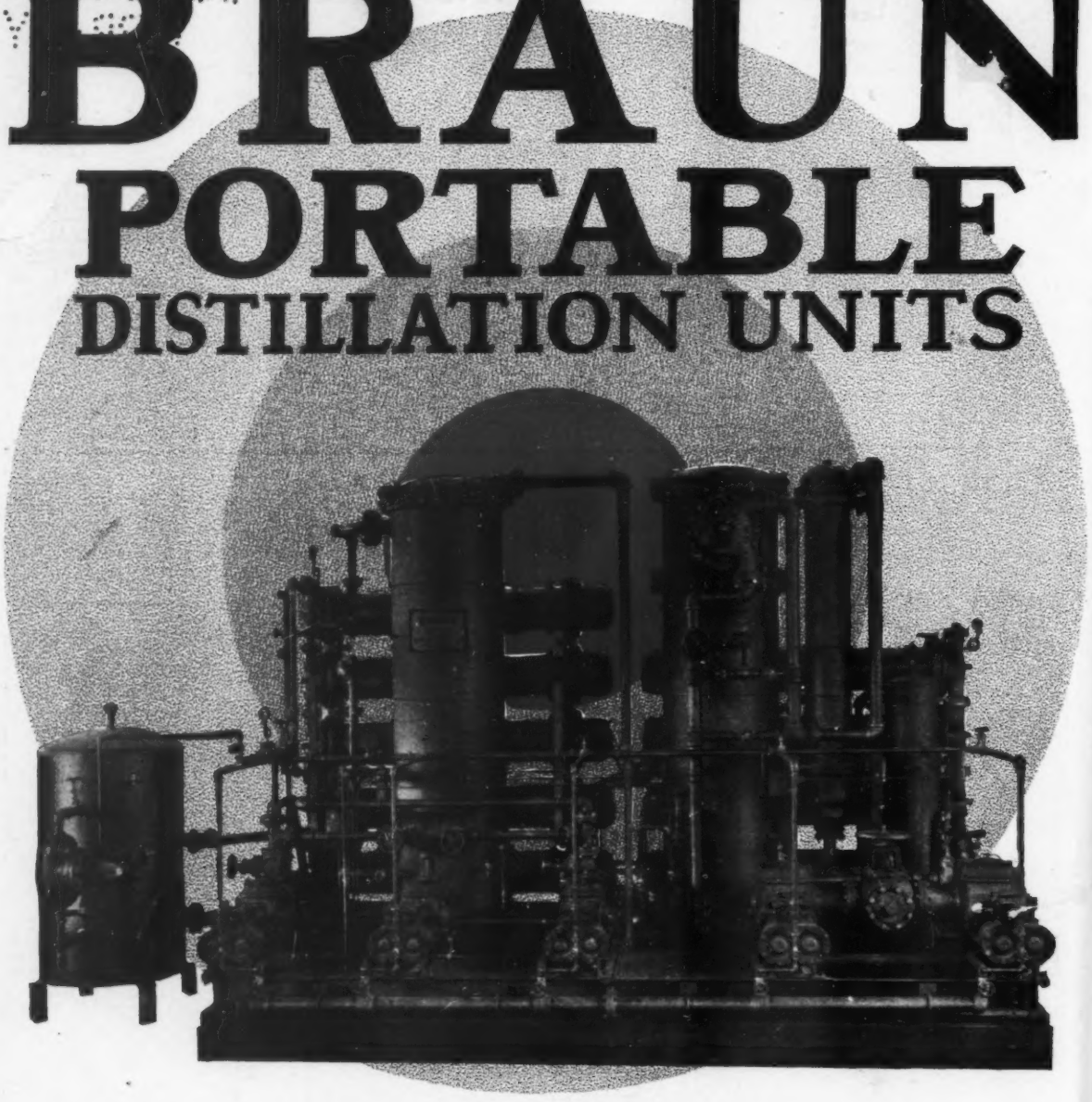
A JENKINS UNIT

—during a recent continuous 1448 hour run [60 1/3 days] produced 25,263 barrels of gasoline. The liquid recovery, not including absorption gasoline was 97.25%.

GRAVER Corporation *Founded 1857*
EAST CHICAGO, INDIANA

NEW YORK Grand Cent. Term. | CHICAGO Steger Building | TULSA Atlas Life Bldg. | HOUSTON West Building

BRAUN
PORTABLE
DISTILLATION UNITS



THE BRAUN Portable Distillation Unit is completely assembled on two sectional steel foundations for quick portability by truck. It has a normal oil circulation of 60,000 gal. /24 hr. with a gasoline output, under average conditions, of 3000 gal. /24 hr. Stocked for prompt delivery.

Other BRAUN Portable, Mobile and Fabricated plants are supplied with gasoline capacities up to 40,000 gal. /24 hr.

BRAUN

C. F. BRAUN & CO.
Manufacturing Mechanical Engineers
ALHAMBRA, CALIFORNIA
New York Tulsa Dallas

Entered as second class mater June 16th, at the Post office at Houston, Texas, under the Act of March 3, 1879.

NEILAN

A COMPLETE realization of our responsibilities in manufacturing devices for the regulation of pressures and the control of liquids is largely accountable for the high quality and superior operation of "Neilan" appliances.

Where efficiency and results are dependent upon sensitiveness, accuracy, and reliable operation, as in the case of regulating devices, these features should rank high above any other consideration.

In "Neilan" devices they do. We place them foremost and above everything else.

A Partial List of Neilan Devices

Reducing Regulators
Back Pressure Regulators
Casing Head Regulators
Vacuum Regulators
Orifice Valves
Gas Fuel Boiler Governors
Balanced Lever Valves
Float Valves
Supersensitive Vapor Recovery System.
Steam Reducing Valves
Pump Governors
Liquid Level Controllers
Gasoline and Water Separation Controllers
Steam Traps
Gasoline Traps
Air Relief Valves
Water Reducing Valves
Altitude Valves
Cushioned Noiseless Check Valves
Vacuum Relief Valves

Pilot Sensitive Back Pressure Gas Regulator No. 65

NEILAN, SCHUMACHER & CO.
641-651 Santa Fe Avenue
Los Angeles, California

REPRESENTATIVES:

Maintenance Engineering Corp.
2000 Harrington Street,
Houston, Texas

Pelican Well Tool & Supply Co.
Shreveport, La.

"You Can Be *Sure* of Neilan Products"

STERLING

STERLING OIL SECTIONS

For manifold use - for continuous use - for cooling

14 Square Foot
STERLING OIL Section

Have Demonstrated Their Worth in the Amarillo Field

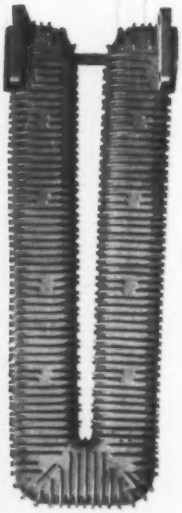
Realizing that the corrosive action of certain oils will attack metals unless special mixes are made to counteract the corrosive elements in the oil, we have run tests on special mixes with the result that *under the same operating conditions—using the same crude* —the Amarillo Refining Company, Amarillo, Texas, has proved that the life of the *NEW* STERLING OIL SECTIONS has increased 50% to date and the Sections are still intact, giving promise of more months of efficient service.

We are constantly improving our product and finding new applications for STERLING OIL SECTIONS and ACCESSORIES in refineries.

STERLING OIL SECTIONS and ACCESSORIES are used in—

Condenser Boxes
Towers
Heat Exchangers
Gasoline Plants
Pre-Heaters

We shall appreciate the opportunity of presenting the possibilities of these Sections to you.



19½ Square Foot
STERLING OIL Section

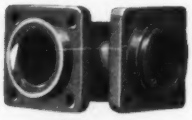
Companion Flanges

Extension Piece

Header

Spool

Return Bend



Elbow

Flanged Tee

Ferrule

These STERLING Accessories provide special cast-iron construction throughout.

AMERICAN RADIATOR COMPANY

Manufacturers of IDEAL Boilers for Oil Burning

40 W. 40th St., New York 816 S. Michigan Ave., Chicago

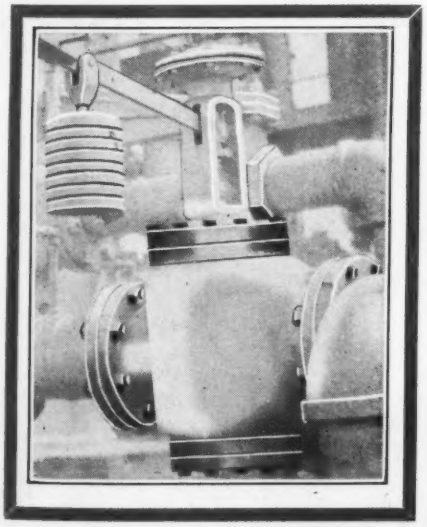
STERLING OIL Sections are immediately available at our plants in Kansas City, Mo., and Springfield, Ohio

The Thinker

The big questions that so often harass the oil man confronted with puzzling control problems have invariably found their answer in FISHER.

FOR example—"How am I going to maintain exactly a certain pressure?" "How can excessive pressure at a given point be relieved?"—the answer is FISHER Automatic Relief Valve, Type 14.

The valve is absolutely automatic, opening at the fixed working pressure and closing promptly after relieving the excess pressure above the working point, so that, except within the narrowest working limits, the pressure never exceeds the point for which it is set. Excessive pressure is impossible when controlled by this valve, and it is invaluable where a desired pressure must be maintained exactly.



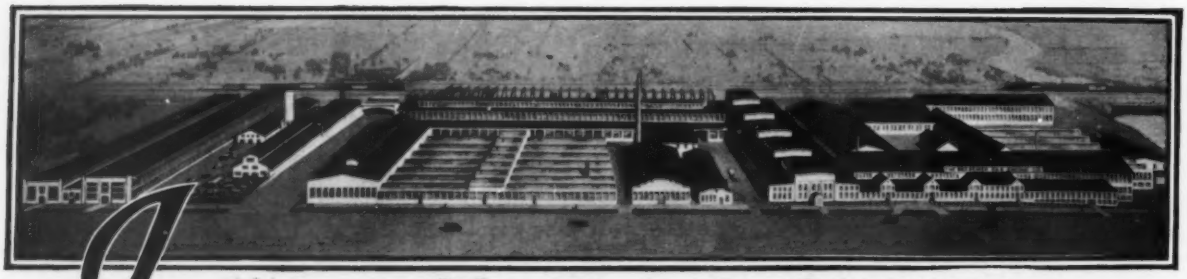
FISHER
TRADE MARK
REGISTERED

The insert to the left shows an installation on the absorber towers in the Hull Gasoline Plant, at Winfield, Kansas, where a Fisher Type 14 maintains a pressure of 40 pounds that is always constant.

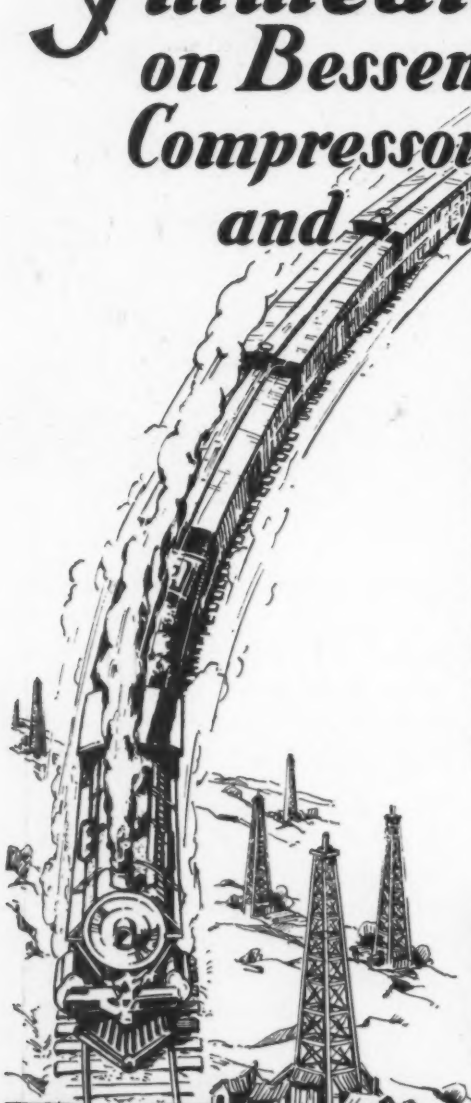
THE FISHER GOVERNOR CO.

1312 FISHER BUILDING
MARSHALLTOWN, IOWA, U. S. A.

Mention Where You Saw the Advertisement



Immediate delivery—on Bessemer Type Ten Compressors—for both high and low pressure work



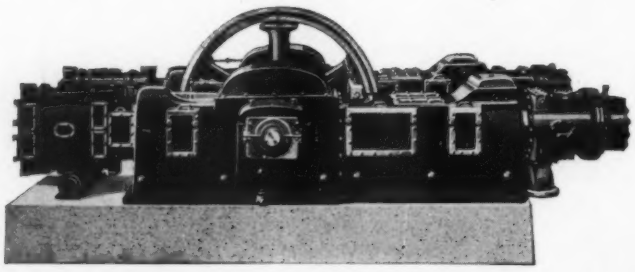
THE BESSEMER FACTORY can make Immediate deliveries on Type Ten Compressors—both with special cylinders for high pressure work or with standard cylinders for lower pressures for gasoline plant work.

Someone started the rumor that Bessemer Type Tens were sold out for months ahead. This is not exact. True, the huge Bessemer Factory is working at capacity to meet the enormous demand for these popular compressors, but greatly increased production facilities have enabled Bessemer to keep pace with the ever-increasing orders. Additional plant space, new machinery and 1,600 skilled workers enable the Bessemer factory to ship Type Tens as fast as the orders are received at the factory.

In spite of the large and growing demand for Type Tens with special high pressure cylinders for flowing wells and for the standard units for gasoline plant work, you can get Bessemers (the best by proven performance) *immediately*. Of course, Bessemer in doing a tremendous business—sheer merit has built it up—but their plant capacity is tremendous too.

You *can* get Bessemers *now!* Don't be misled into buying stop-gap equipment when you can get known performance, known reliability—known quality—Bessemers.

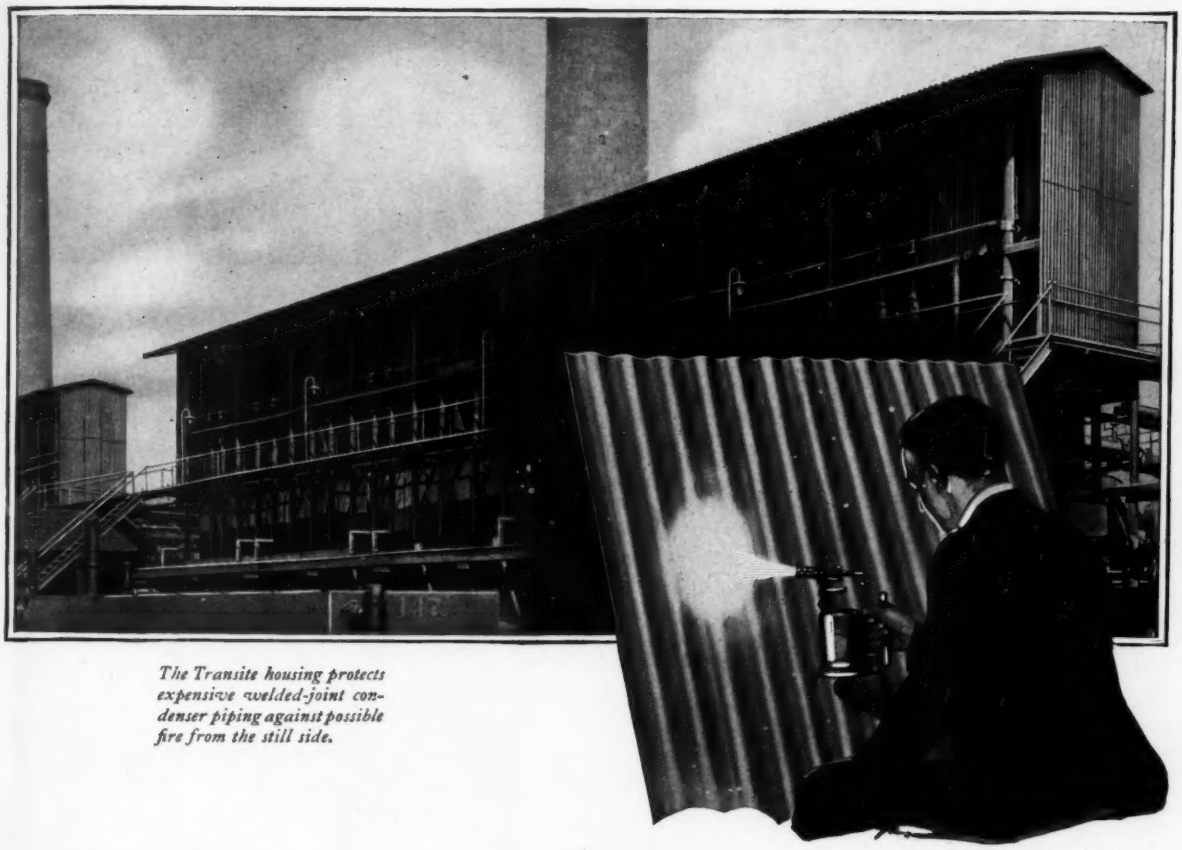
THE BESSEMER GAS ENGINE COMPANY
13 York Street ∴ ∴ Grove City, Pa.



BESSEMER

BESSEMER OIL FIELD ENGINES – COMPRESSORS VACUUM PUMPS – ROLLER PUMPING POWERS

Mention Where You Saw the Advertisement



The Transite housing protects expensive welded-joint condenser piping against possible fire from the still side.

Transite stands the blow-torch test. It is all mineral.

For fire protection

Transite Corrugated Asbestos Roofing and Siding

FIRE, weather, and time have little effect upon Transite Corrugated Asbestos Roofing and Siding —hence it is an ideal fire barrier where oil industry equipment should be protected.

Use it for housings, walls and roofing around aerial condensers, tanks, rundown lines, and other vital points where the spread of fire would do serious damage.

Use it also as a permanent non-rust roofing and siding for regular building construction. It is not only more fire-safe but costs less per year than roofings which require upkeep.

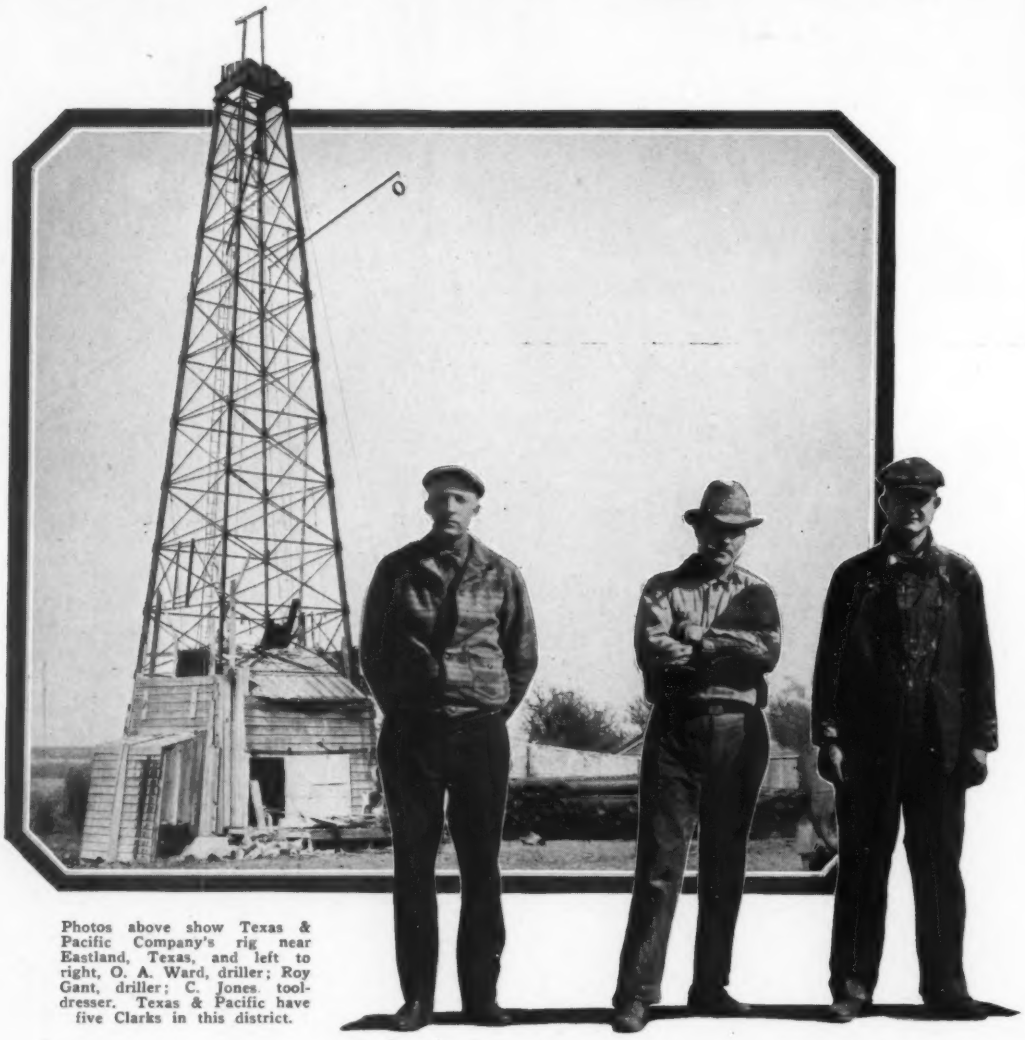
JOHNS-MANVILLE CORPORATION, Madison Ave. at 41st St., New York
Branches in all large cities For Canada: CANADIAN JOHNS-MANVILLE CO., LTD., Toronto

JOHNS-MANVILLE

Oil Industry Department

Asbestos and its allied products
INSULATION
BRAKE LININGS
ROOFINGS
PACKINGS
CEMENTS
FIRE PREVENTION PRODUCTS

"CLARK ENGINES are STEAM in drilling motion,



Photos above show Texas & Pacific Company's rig near Eastland, Texas, and left to right, O. A. Ward, driller; Roy Gant, driller; C. Jones, tool-dresser. Texas & Pacific have five Clarks in this district.

CLARK BRO

the nearest things to and the FURTHEST from STEAM in drilling grief"

Listen to the drillers sing the praise of Clark Engines; hear what the men who use them, year after year, say about their dependability, their economy and their trouble-free operation. What is the answer?

CLARK ENGINES ARE S-L-O-W S-P-E-E-D engines. That accounts for their ideal drilling motion; their longer life; their low upkeep. This slow speed principle is the first thing to consider in buying a drilling engine—because from this principle comes the many advantages that are offered only in the Clark Engine.

The clutch on the Clark Drilling Engine is the only clutch that is supported with TWO bearings, one on each side of the pulley. It is the only clutch that was designed especially for DRILLING ENGINES. Our Clutch is fully covered by patents. It is operated with a floating shaft and is built like a high class automobile—it costs many times more than the ordinary "pumping Engine" clutches which are used in a majority of other makes of engines; but drillers who have used a Clark Engine say that our clutch is so far ahead of competition as to be outside of comparison. For drilling results use the engine that is designed to give them. For further information address

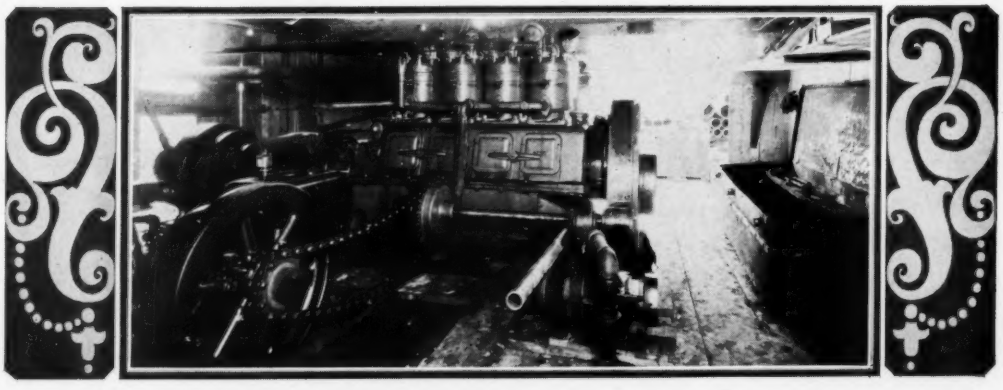
CLARK BROS. COMPANY

OLEAN, N. Y.

or

125 W. First Street, Tulsa, Oklahoma
Warehouses at Tulsa, Sweetwater, McCamey, Texas and Artesia, N. M.

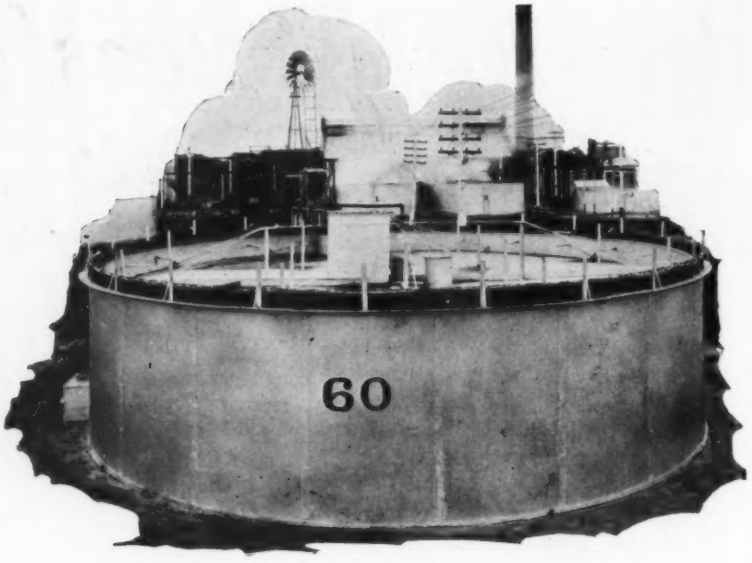
Smith-Booth-Usher Co.,
225 E. Central Ave., Los Angeles
50 Fremont St., San Francisco



OS ENGINES

Mention Where You Saw the Advertisement

Air would steal oil right out of this tank--



But it can't get by the Wiggins Roof—

WHENEVER air comes in contact with oil it absorbs vapor from the lighter fractions. It steals from your crude working tanks, your gasoline run-down tanks, your gasoline storage tanks, etc. The U. S. Bureau of Mines has estimated that the total loss due to such evaporation amounts of 7½% of the volume of crude oil produced.

The only way to prevent such losses is to keep air away from the oil. Recovery systems do not eliminate the cause of the loss. For all practical purposes, Wiggins Roofs do keep air away from the oil in any tank to which they are applied.

The floating pan covers practically the entire oil surface—97.12% of it in a 55,000 gallon tank. Under normal conditions the remaining 2.88% is sealed gastight. Air accidentally pumped into the tank through the filling line gathers in this gastight seal and is vented into the atmosphere after giving up entrained oil. When a sliding shoe travels over joints in the tank shell, there is practically no evaporation loss from the oil at the bottom of the deep slot, because it is protected by a heavy vapor.

One big refinery reports a daily saving of 17.85 gallons of gasoline (62.9 degrees A. P. I.) on a 50-foot tank provided with Wiggins Roofs as compared to a fully insulated gastight tank. Other records on tanks of all sizes, in all classes of service, prove that Wiggins Roofs can practically eliminate evaporation losses. Ask for this information and estimates on equipping your tanks, either new or old.

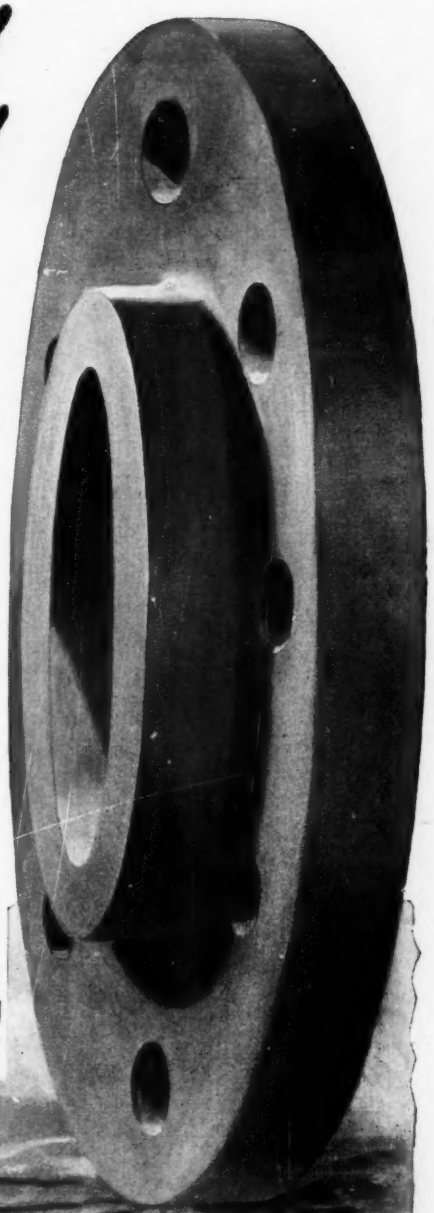
Chicago Bridge & Iron Works

Chicago, 2463 Old Colony Bldg.
New York, 3102 Hudson Terminal Bldg.
Cleveland, 2234 Union Trust Bldg.
Dallas, 1655 Praetorian Bldg.
Atlanta, 1046 Healey Bldg.
San Francisco, 1051 Rialto Bldg.

WIGGINS ROOF RNGM4-Gray

Mention Where You Saw the Advertisement

No better Flanges! No better Service!



Indestructibility! Quick availability!

These are the two big reasons for the steadily increasing use of Penn Forge Flanges. More and more industrial engineers are coming to know that "Penn Forge" means dependable flanges delivered ON TIME!

Penn Forge Flanges cost less in the long run. They insure perfectly sealed joints—and they withstand every shock and strain of high pressure, expansion and contraction, fluctuating temperatures, water hammer, accidental blows—everything.

Any Alloy You Desire

Selected open hearth steel, with a tensile strength of 60,000 lbs., elastic limit 30,000 lbs.—or if corrosion is a problem, Stainless Steel, Monel Metal, nickel, copper—any alloy.

Large stock and tidewater location mean prompt delivery. Less than carload lots sent direct to main freight stations. Branch stocks at many points throughout the country.

No better flanges! No better service!

PENNSYLVANIA FORGE COMPANY, Philadelphia

Stocks carried at most branches

San Francisco:
Chas. I. James, 525 Market Street

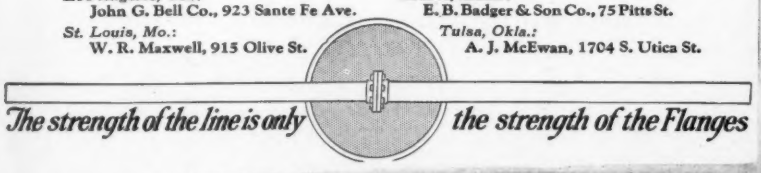
Los Angeles, Cal.:
John G. Bell Co., 923 Sante Fe Ave.

St. Louis, Mo.:
W. R. Maxwell, 915 Olive St.

Phila., Pa.:
Ford & Kendig Co., 1428 Callowhill St.

Boston, Mass.:
E. B. Badger & Son Co., 75 Pitts St.

Tulsa, Okla.:
A. J. McEwan, 1704 S. Utica St.



The strength of the line is only the strength of the Flanges

Penn Forge Flanges

Mention Where You Saw the Advertisement

Silvr-Cool has proven

That there is a thoroughly satisfactory ready mixed aluminum paint—a finished product that means uniformity—undivided interest—responsibility—complete service.

Silvr-Cool does what no other Aluminum Paint does, whether ready mixed or ready to mix. Results in actual service in all oil producing countries of the world have demonstrated that—

Silvr-Cool is always ready for use.
Silvr-Cool comes out of the package as good as it goes in.
Silvr-Cool has the brightest lustre of any Aluminum Paint.
Silvr-Cool is the easiest aluminum paint to apply.
Silvr-Cool reduces evaporation losses to a minimum.
Silvr-Cool wears longest—

Painting with Silvr-Cool costs less per year.

SILVR-COOL
The Super Aluminum Paint

IS MADE BY

Detroit Graphite Company
DETROIT, U.S.A.

Manufactured in Canada by Dominion Paint Works Limited
Walkerville, Ontario. Offices at all principal centers

Accuracy Accuracy

IN JAVA
in the service of one of the Royal Dutch Shell Companies this meter is measuring the production of the well seen close by. This, and the other illustrations here shown, are typical of thousands of Metric Meter installations in foreign countries.

All Around the World

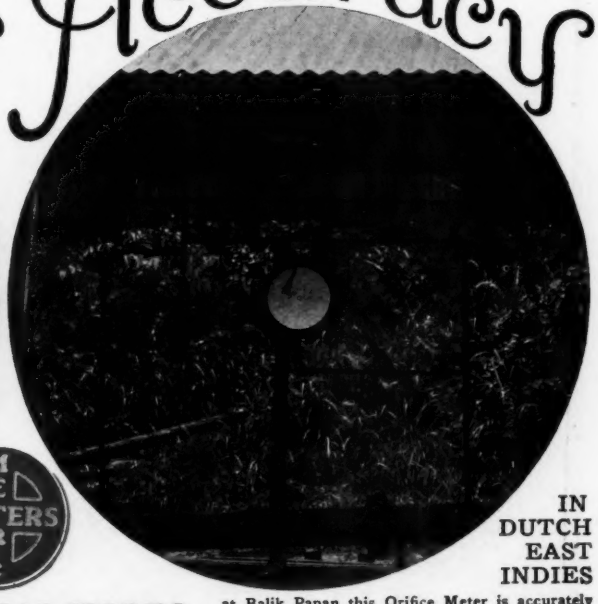
IN SUMATRA
at Pangkalan Brandan, this Metric is measuring the quantities of methane-gas being burned under boilers in service of The Asiatic Petroleum Co. (N. Y.) Ltd. The "Administrator" writes,—"after adjustment meter indicates accurately and gives no rise to complaints."

METRIC orifice METERS

are giving characteristic accuracy

Accuracy Accuracy

IN INDIA
this Metric Orifice Meter was installed in order to observe the gas production in relation to the oil production of a new well at Soeban Djerigi.



IN DUTCH EAST INDIES
at Balik Papan this Orifice Meter is accurately measuring the production of the Asiatic Petroleum Company's well No. 206 Louise District I.

METRIC METAL WORKS
of the AMERICAN METER CO., Inc.
ERIE PENNSYLVANIA

Sales Service
WESTCOTT & GREIS, Inc.
Dallas TULSA Los Angeles

MEASURE WITH METRICS—METRIC MEANS MEASUREMENT

Mention Where You Saw the Advertisement

The Holmes-Manley *Cracking* Process

Coke formation in stills, working and storage tanks is being constantly reduced:—

1925 65/100 of 1%
1926 48/100 of 1%

The Licensee receives:—

1. *A Proven Process*
2. *Complete Technical Service*
3. *The Benefit of Future Developments*

Licenses Granted by

THE TEXAS COMPANY, U. S. A.

Apply to

W. S. S. RODGERS
17 Battery Place, New York, N. Y.

Keep Your Brickwork In Good Condition With This New Method of Maintenance

IF furnace brickwork could be maintained in a condition approximating its newly-built state, it is readily apparent that lining life would be materially prolonged, and that refractory repair costs would be greatly reduced.

Botfield Refractories Company, pioneer manufacturer of high temperature cement, has developed a method of maintenance that makes it easy to keep fire brick construction in good condition through periodic and systematic maintenance of brickwork.

Fig. 1

By this new method, linings can be returned to good condition whenever the furnace is out of service for a short time. Cracks, crevices, joints and brick pores can be filled up, quickly and efficiently. Burned-out sections and depressions can be patched. Walls can be maintained at their original thickness, with a smooth uniform surface presented to the attack of flame and other destructive elements encountered in furnace operation. Sometimes, the repairs can be made without interruption of furnace operation.

In this method of brickwork maintenance, three major elements are employed. They are The ADAMANT Gun, ADACHROME (a chemically-neutral refractory material), and ADAMANT Fire Brick Cement.

Fig. 2

The ADAMANT Gun is used for blowing protective coatings on brickwork in the form of pre-mixtures of ADACHROME (or other refractory materials) employing ADAMANT Cement as a binder. Weighing less than four pounds, The ADAMANT Gun requires only **one man** for operation. It uses air at from 50 lbs. to 80 lbs. pressure. The operator simply connects the air line to the ½-inch standard pipe thread opening on the Globe Valve of The ADAMANT Gun, places the Supply Pipe in the pre-mixture, turns the Globe Valve, and The ADAMANT Gun sprays the pre-mixture smoothly and evenly on the structure. Thus, all brick pores, open joints, cracks and crevices are quickly filled up, the wall is given a protective coating that is highly refractory and resistant to the attack of fusible coal ash, sulphur and other impurities in either coal or oil fuel which cause fluxing, slagging or melting of the brick.

Figure 1 shows a side wall in the furnace of a 600 H. P. boiler, cleaned and ready to receive a coat of the ADAMANT-ADACHROME mixture.

Figure 2 shows the operator blowing the pre-mixture on the wall with The ADAMANT Gun.

Figure 3 shows the same wall, after it has been thoroughly coated. Note that all the joints, cracks, crevices and brick pores are filled up, and the entire structure provided with a more uniform and highly refractory surface which will prolong the life of the wall. This practice should be followed every time the opportunity presents. Side walls, front walls, bridge walls and arches in boiler furnaces, as well as brickwork in stills and other types of refinery furnaces, should be treated in this same manner at frequent intervals. Consistently used, this method will keep your furnace linings in excellent condition—eliminating many a relining and effecting appreciable savings in refractory repair costs.

The mixtures of ADAMANT-ADACHROME vary with each operating condition, being dependent on fuel used, and other factors. If you will give us an outline of your operating conditions, we shall be glad to recommend mixtures of ADAMANT-ADACHROME that will be perfectly suited for your purposes. Send for these recommended mixtures, and let us explain how inexpensive it is to employ this new maintenance method in your refinery.

Fig. 3

Stocks of ADAMANT *Fire Brick Cement are maintained in every refining district of the country. Send for the name of the distributor nearest you.*

Botfield Refractories Co.

783 S. Swanson St., Philadelphia, Pa.

5th Floor, 110 W. 34th St., New York

For a Long Furnace Run, Use The ADAMANT *Gun*

ADAMANT

FIRE BRICK CEMENT

Whenever You Use a Fire Brick, Use ADAMANT, *The Original High Temperature Cement*

SUNOCO

CONSERVATION

***The manufacture of Natural Gasoline is built on the conservation* of a waste product!**

You are not conserving, unless you are recovering all the Natural Gasoline contents possible.

Sunoco Absorption Oils
630 *and* 670

—will enable you to get the desired results. WHY? because each is manufactured and especially recommended for a special purpose.

Samples and quotations furnished on request. Your inquiries will receive our prompt attention.

SUN COMPANY

Petroleum Bldg., Tulsa, Oklanoma

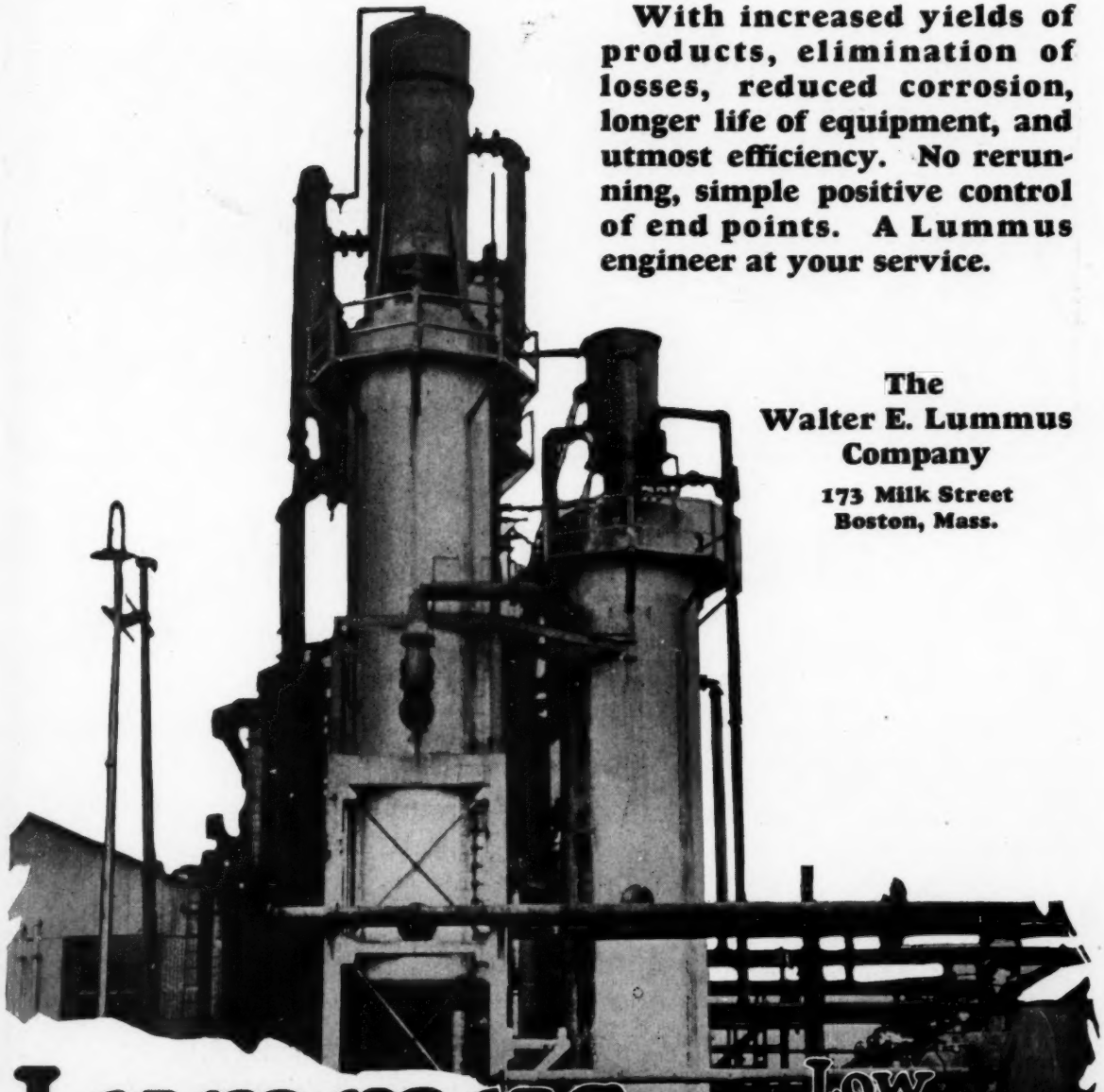
Refineries at

Marcus Hook, Pa. **Yale, Oklahoma** **Toledo, Ohio**

Mention Where You Saw the Advertisement

Low Temperature Refining

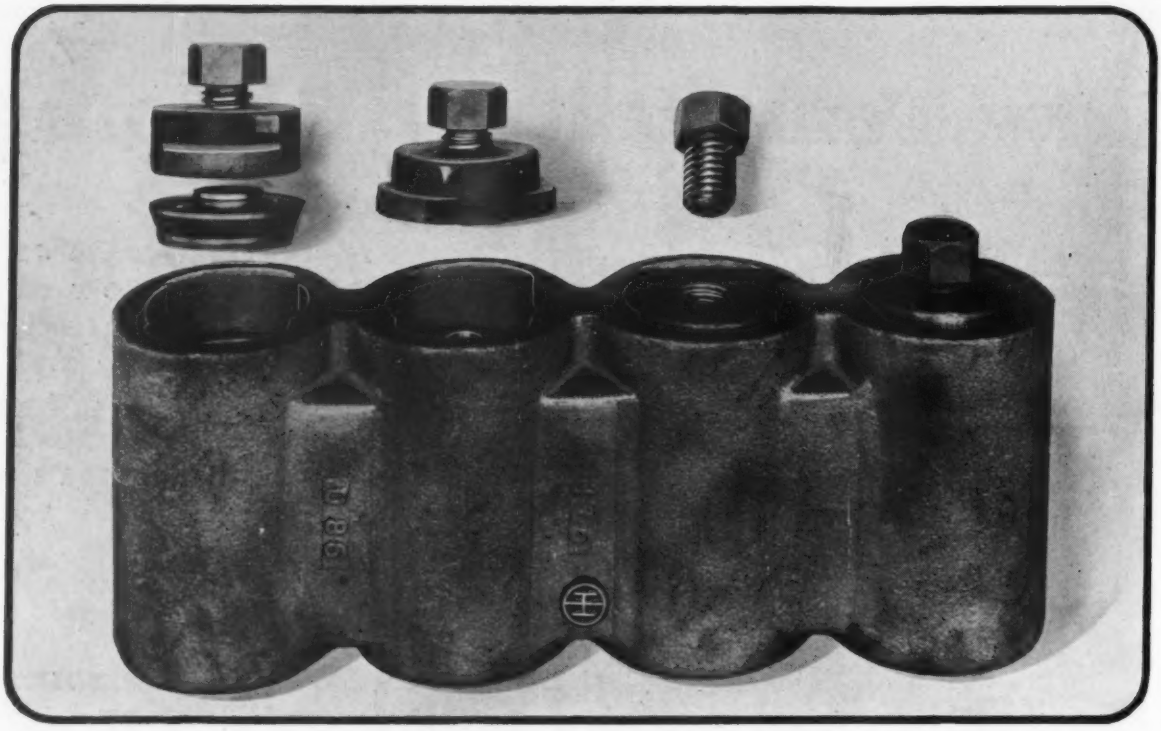
With increased yields of products, elimination of losses, reduced corrosion, longer life of equipment, and utmost efficiency. No rerunning, simple positive control of end points. A Lummus engineer at your service.



The Walter E. Lummus Company
173 Milk Street
Boston, Mass.

Lummus Low Temperature Refining Systems

Mention Where You Saw the Advertisement



The Ohiolock Plug

A Quicker Acting Closure

Any reduction in the time required to close down your stills and clean out the tubes represents a real saving.

That is where the "OHIOLOCK" plug can help you reduce costs, and get more actual operating time from your units. Its quicker action cuts this time of shut-down to an absolute minimum.

The application is simple. Just insert the plug, a quarter turn to the right locks it in position, then tighten the set screw and the job is done. Compare this simplicity and ease of operation with the slow difficult application of a screwed or tapered plug.

There is just as much or more difference in the removal. The improved plug has no threads to leak, corrode, stick or become damaged in handling.

This closure is locked in place and cannot loosen up in service. It has greater strength than ordinary types and will meet any pressure condition.

Learn more about "OHIOLOCK."

The Ohio Steel Foundry Co.

Springfield, Ohio

SALES OFFICES:
HOUSTON—HARRISBURG PIPE & PIPE BENDING CO., OF TEXAS
CHICAGO—PEOPLES GAS BLDG.
NEW YORK—75 WEST ST.
PHILADELPHIA—22 SO. 18TH ST.
LOS ANGELES—4020 LOMA VISTA AVE.

PLANTS IN
SPRINGFIELD
LIMA

Mention Where You Saw the Advertisement

Have you investigated the POSSIBILITIES of HIGH VACUUM?

Many refineries are today operating refining processes at vacua formerly thought impractical. They have discovered great economies and an improved product with the increased vacuum.

ELLIOTT AIR EJECTORS

are both the means of obtaining the very highest possible vacuum, as well as simplifying vacuum producing apparatus. An Elliott Air Ejector is almost unbelievably simple. It has no moving parts, requires no operating attention, no lubrication, practically no upkeep expense, and unlike other forms of vacuum pumps, requires no foundations. Yet it establishes and maintains higher vacua than can be secured by any other method.

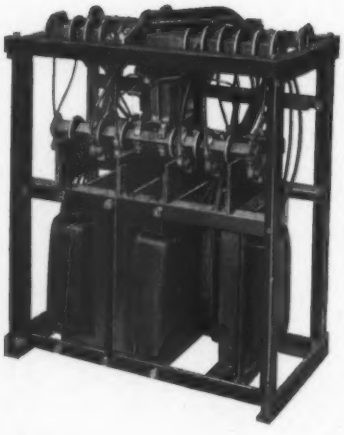
Let our engineers tell you what Elliott Air Ejectors may accomplish in your refinery. Our men have had considerable experience in this field, and know how to adapt our apparatus to your processes.

ELLIOTT COMPANY
PITTSBURGH, PA.
General Offices **JEANNETTE, PA.**
Sales Offices in principal cities

C-301

Mention Where You Saw the Advertisement

A Flame-Proof Starter for High Voltage Motors



The EC&M line of Oil-Immersed, Flame-Proof Automatic Starters for A. C. motors is complete.

The 2300 volt EC&M Automatic Compensator illustrated here is used with squirrel cage and synchronous motors. It is operated from a small, oil-immersed master switch.

The welded boiler-plate oil tank contains the starting transformers, control transformer to provide low voltage for the master switch circuit and double throw automatic contactor.

EC&M Automatic Starters permit anyone to safely start your motors, large or small. The operator has no control over the rate of acceleration.

Since no enclosing structures are necessary, installation costs are reduced.

EC&M Oil-Immersed Automatic Compensators are used in the oil industry because they reduce the fire hazard. They do not wear out or corrode. They protect the motors, save power, save installation costs and may be mounted anywhere, indoors or out.

Send for Bulletin 1047

THE ELECTRIC CONTROLLER & MFG. CO.

BIRMINGHAM - BROWN-MARX BLDG.
CHICAGO - CONWAY BLDG.
CINCINNATI - 1ST NATIONAL BANK BLDG.
DETROIT - DIME BANK BLDG.
NEW YORK - 50 CHURCH ST.

CLEVELAND, OHIO

LOS ANGELES - AMERICAN BANK BLDG.
SALT LAKE CITY - 228 W. SO. TEMPLE
PHILADELPHIA - WITHERSPOON BLDG.
PITTSBURGH - OLIVER BLDG.
SAN FRANCISCO - CALL BUILDING
SEATTLE - 570 COLMAN BLDG.
TORONTO - METROPOLITAN BLDG.

Mention Where You Saw the Advertisement

Vogt Drop Forged Steel Gate Valves For High Pressures & Temperatures

HENRY VOGT MACHINE CO.
INCORPORATED
LOUISVILLE, KENTUCKY

Mention Where You Saw the Advertisement

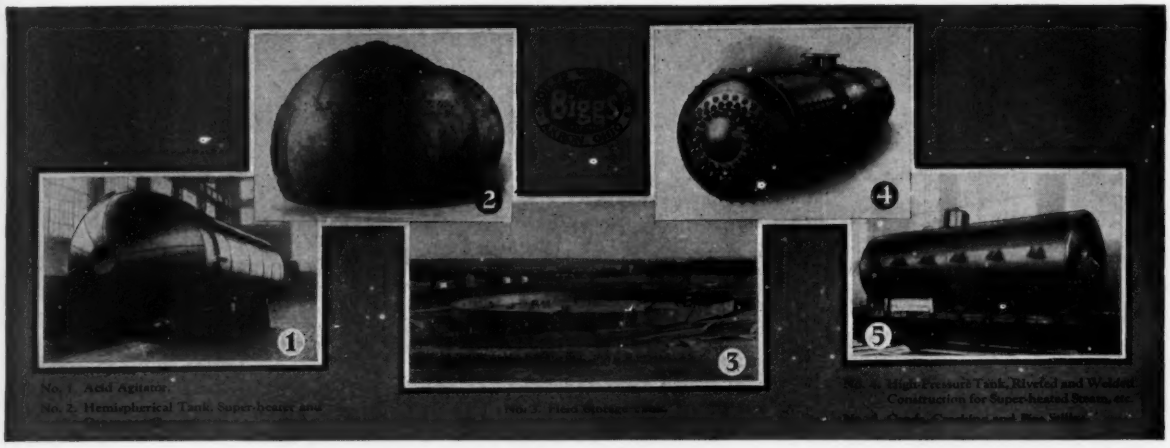
HOPE
VERTICAL
GAS ENGINES
3 and 4 CYLINDERS — 60 to 250 H.P.

Hope standards, which admit no compromise with quality for the sake of a lower price, reveal themselves in the Hope Engine to any competent observer. Its superiority of design and construction are obvious, under any comparison. And its outstanding value becomes more and more apparent with the passing of years under, even the hardest service.

Tell us your power requirements and let us discuss economies

HOPE ENGINEERING & SUPPLY COMPANY
MT. VERNON, OHIO, U.S.A.

HOPE ENGINEERS & CONTRACTORS IN NATURAL GAS AND OIL HOPE



No. 1. Acid Agitator.
No. 2. Hemispherical Tank, Super-heater and
No. 3.
No. 4. High Pressure Tank, Riveted and Welded Construction for Super-heated Steam, etc.

Built To "Stand The Gaff"—

Biggs Equipment for Producer and Refiner Will survive those Gruelling Tests

Equipment, to win the endorsement of producers and refiners, must often resist the most severe tests imaginable. That's why we build Biggs products to "stand the gaff".

Biggs Pressure Tanks, for instance, have in actual tests withstood forces dangerously above rated capacities. Little wonder, is it, that they are the choice of knowing oil men?

Such is the manner of tests often applied to Biggs producing and refining equipment and it is with such gruelling tests in mind that we construct Biggs tanks, agitators, stills and other steel plate equipment to be just a bit better than the best.

However, ability to "stand the gaff" is not the only sales argument for Biggs equipment. There's price, delivery and guarantee—all of first interest to the prospective buyer—and all recognized by Biggs as buying factors.

Whether or not you are in the market at this time, you will be interested in our leaflet, "What Biggs Does and How", pictorially explaining our processes of manufacture.

Manufacturers of

- Pressure Stills for Cracking Process
- Fractionating Towers
- Dephlegmating Towers
- Bubble Towers
- Heat Exchangers
- Agitators
- Steam Stills
- Crude Stills
- Condenser Boxes
- Run Down Tanks
- Blending Tanks
- Hemispherical Tanks
- Blow Cases
- Acid Tanks
- Compounding Kettles
- Storage Tanks to 80,000 Barrels
- Smoke Stacks and Breechings, etc.

THE BIGGS BOILER WORKS COMPANY

Eastern Sales Office:
300 Madison Avenue, New York City

General Office and Works — Akron 25, Ohio

Please attach to your letterhead

THE BIGGS BOILER WORKS COMPANY
Akron 25, Ohio
Send "What Biggs Does and How" to

NAME.....

.....

We are particularly interested in

.....

.....

The Biggs Boiler Works Co. Akron Ohio Est 1857 — Trade Mark Registered

TANKS AND GENERAL
STEEL PLATE WORK
for the Oil Industry

The Cook Painter Boy Announces

A New COOK FACTORY in HOUSTON

Giving Better Service to the Petroleum Industry—

To its splendidly equipped factories at Kansas City, St. Louis and Fort Worth, the Cook Paint & Varnish Company now adds a fourth—at Houston. This newest factory is already "in production", making Cook's Products for the Great Southwest.

Thus, *with four factories and ten branches* in the mid-continent oil fields, Cook takes an unquestioned position of leadership for quick shipments and dependable service to the petroleum industry.

As pioneers in the development of specialized paints for your use, we invite you to send for our free booklet, *"Paints for the Oil Industry."*

COOK PAINT & VARNISH COMPANY

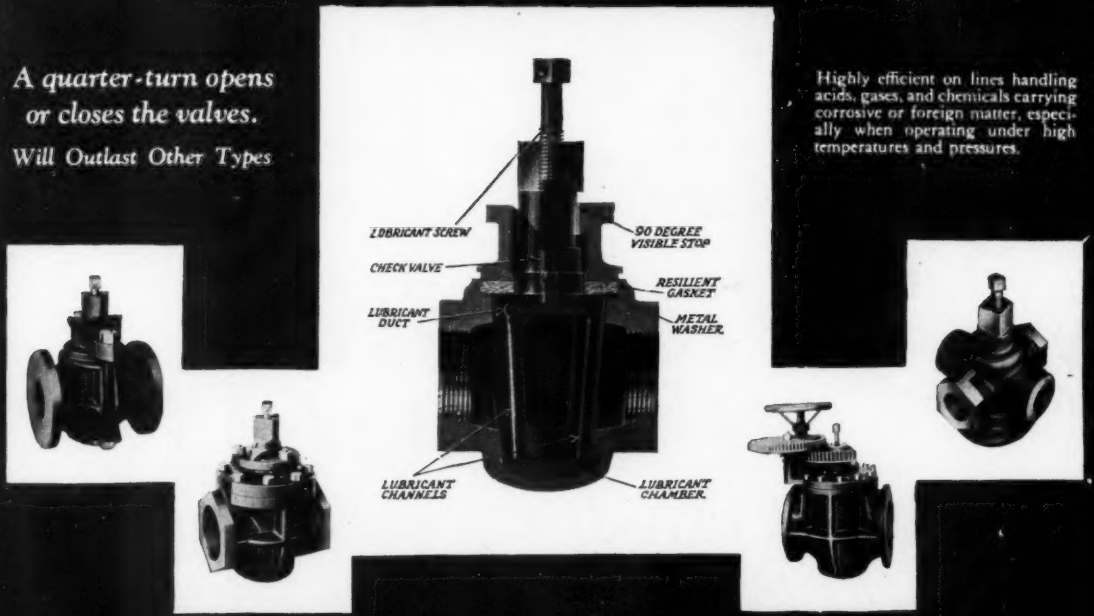
Factories: Kansas City — St. Louis — Fort Worth — Houston
Branches: Chicago — Detroit — Omaha — Wichita — Oklahoma City — Tulsa
Dallas — Denver — Kansas City, Kansas — St. Joseph, Missouri

Mention Where You Saw the Advertisement

The Valves lubricated under pressure will not leak!—will not stick!

A quarter-turn opens or closes the valves.
Will Outlast Other Types

Highly efficient on lines handling acids, gases, and chemicals carrying corrosive or foreign matter, especially when operating under high temperatures and pressures.



The Merco Nordstrom Plug Valve is unique in that it operates on a lubricating principle, the lubricant being forced by a set screw through a hole in the shank of the valve and grooves along the side of the plug to the bottom of the valve, lifting it and greasing it by hydraulic pressure. Different lubricants are used for different services, depending upon the nature of the fluid or solution. For all pressures and purposes, built in sizes from ½" to 16". Catalog upon request.

MERCO NORDSTROM VALVE COMPANY
SUBSIDIARY OF THE MERRILL COMPANY
Engineers— Manufacturers

San Francisco 121 Second Street · New York 110 W. 40th Street · Chicago Peoples Gas Building · MERCO · Houston 813 Washington Avenue · Cleveland 525 Engineers Building · Agencies in Principal Cities

Merco Nordstrom PLUG VALVES

Mention Where You Saw the Advertisement

The G-R Mineral Seal Oil Heat Exchanger

THE highest possible rate of heat transfer is secured in the G. R. Mineral Seal Oil Heat Exchanger by the strictly counter-current flow of lean and rich oils.

Besides this practical service advantage, its twin arrangement makes it exceptionally compact and easy to inspect, clean, and transport to new locations if desired.

All oil connections are at the same end to simplify piping, and the construction eliminates expansion strains and likelihood of leakage or breakage.

These advantages and the features of construction of the G-R Mineral Seal Oil Heat Exchanger are explained in leaflet which will be sent on request.

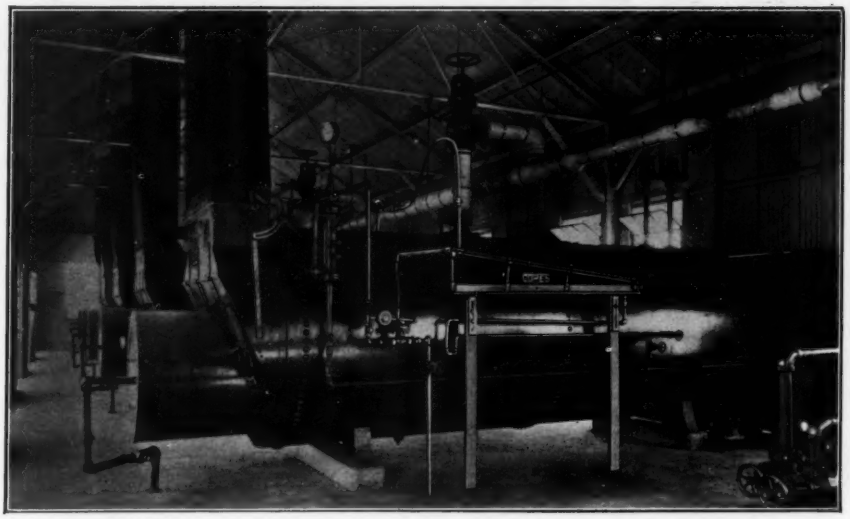
The Griscom-Russell Co., 285 Madison Ave., New York

Philadelphia	Chicago	St. Louis	San Francisco
Boston	Cleveland	Kansas City	Los Angeles
Rochester	Detroit	Charlotte	Seattle
Pittsburgh	Milwaukee	New Orleans	Denver
Columbus	Minneapolis	Houston	Salt Lake City
Atlanta	Indianapolis	Dallas	Tulsa

For Canada: Riley Engineering and Supply Co., Ltd., Toronto

Griscom-Russell
Heat Transfer Apparatus

Mention Where You Saw the Advertisement



Copes Regulators on a battery of 90 horsepower Oil Field Type Boiler in a natural gasoline plant.

Most Refineries and Gasoline Plants Use Copes Feed Water Regulators

Many oil companies now put a Copes Regulator on every boiler used in a natural gasoline plant.

These users find that the Copes regulates the input of boiler feed water with greater safety, reliability and accuracy than is possible by hand.

Especially on oil or gas fired boilers, where the fuel supply is automatically regulated, Copes Feed Water Regulators complete the work of making the boiler plant entirely automatic. In the Copes-equipped boiler plant, it is necessary for only an occasional trip to the boiler room by the man who takes care of the stills and engines. The labor saving made possible by this automatic control of feed water often amounts to more than $300 a month in each gasoline plant.

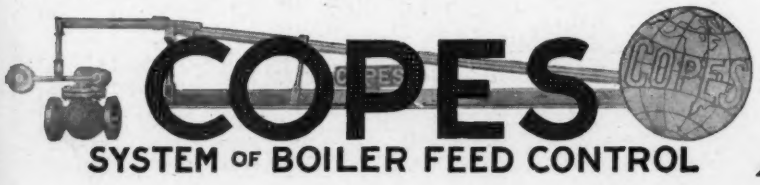
By equipping the small portable gasoline plant boilers with Copes Regulators and gas regulators, one man can look after the entire plant. As the boiler plant is often located a distance from the absorption unit, it would be almost impossible for one man to look after such a plant without this automatic boiler equipment.

The Copes is also widely used in the power plants of the big refineries. 28,000 Copes Regulators are now in service. On any size or type of boiler, they provide feed water control that is rugged, fool-proof, safe, reliable and accurate.

L. L. Baker, Chief Engineer of the Barnsdall Refining Co., has recently written an article on "Advantages of Boiler Feed Water Regulation in the Oil Industry." In it he tells of the improvement in natural gasoline plant and refinery operation through the automatic control of boiler feed water. A copy of Mr. Baker's article will be gladly sent to you for the asking. The coupon is for your convenience.

Northern Equipment Co., 620 Grove Drive, Erie, Pa.

Stock carried by B. W. Vinson, National Bank of Commerce Bldg., Tulsa.



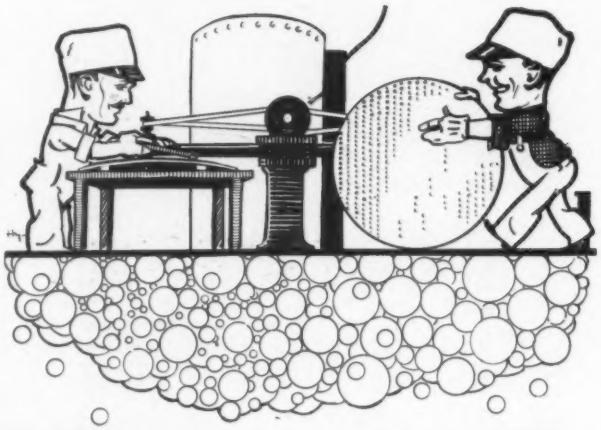
TEAR OFF COUPON AND MAIL

Northern Equipment Co.
620 Grove Drive,
Erie, Pa.

Please send me a copy of L. L. Baker's article on "Advantages of Boiler Feed Water Regulation in the Oil Industry."

Name.....
Company.....
Address.....

Mention Where You Saw the Advertisement



Campbell Business is built on BUBBLES!

We've put billions and billions of bubbles to work—and they are paying good dividends—dividends to the gasoline plant in the form of greatly increased production—and dividends to us in the form of constantly increasing orders.

The utilization of oil-froth to extract natural gasoline from wet gas has been one of the outstanding achievements in the gas industry—and it is a contribution generally accredited to Campbell Engineers.

J. A. Campbell

Consulting—Designing—Construction
Natural Gas Engineer

P. O. Box 669 Long Beach, Calif.

CAMPBELL
OIL FROTH
absorber

Mention Where You Saw the Advertisement

The Standard Oil Co. Buys
Laclede-Christy Flat Arches

The Texas Co. Buys
Laclede-Christy Flat Arches

The Empire Refineries Buy
Laclede-Christy Flat Arches

Producers & Refiners Corp. Buys
Laclede-Christy Flat Arches

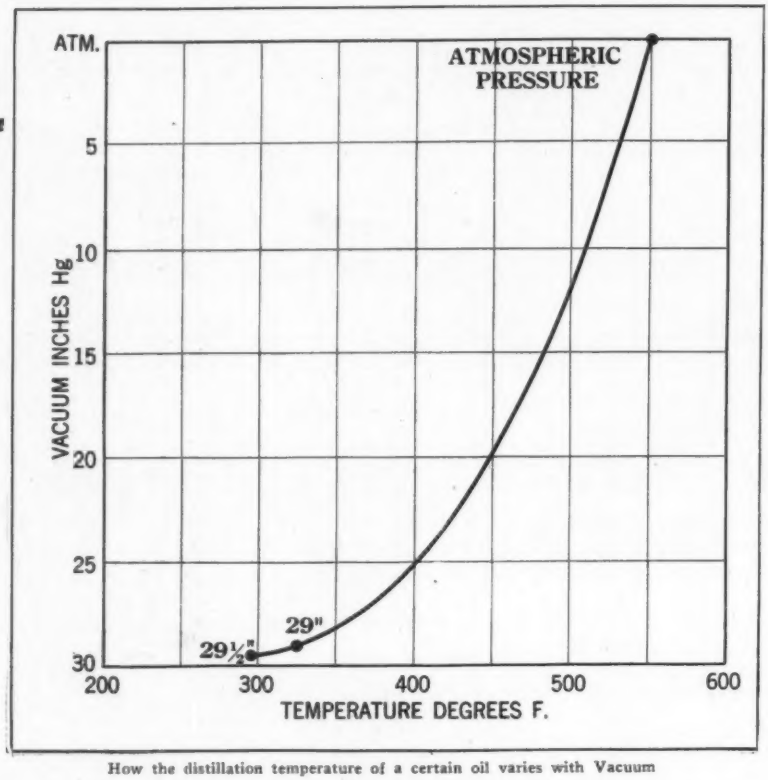
The Gulf Refining Co. Buys
Laclede-Christy Flat Arches

The Barnsdall Refining Co. Buys
Laclede-Christy Flat Arches

All Big Refiners Buy
Laclede-Christy Flat Arches

L9

To Reduce Temperature—Reduce Pressure



How the distillation temperature of a certain oil varies with Vacuum

VACUUM distillation will prevent overheating of lubricating stock. High pressure in a lubricating still produces a thin, watery, distillate, and a thick tarry residue. Wheeler Vacuum distillation apparatus comprises vapor heat exchangers, oil condensers and steam jet vacuum pumps. The steam jet vacuum pump has no moving parts and is the most economical method of producing a high vacuum (29½ in. or above). Write to the Wheeler Condenser and Engineering Company for further details.

WHEELER
CONDENSER & ENGINEERING CO.
Works, **CARTERET, N.J.**
and NEWBURGH, N.Y.
Main Office—149 Broadway, New York City

WHEELER
Oil Refinery Equipment

HEAT EXCHANGERS
(Liquid to Liquid)
VAPOR HEAT EXCHANGERS
FINAL CONDENSERS,
VACUUM CONDENSERS,
PARTIAL CONDENSERS
THERMO COMPRESSORS.

Other Products Include:

Cooling Towers,
Surface Condensers,
Steam Jet Air Pumps,
Expansion Joints,
Heaters,
Evaporators,
Centrifugal Pumps,
Brass and Copper Tube and Pipe.

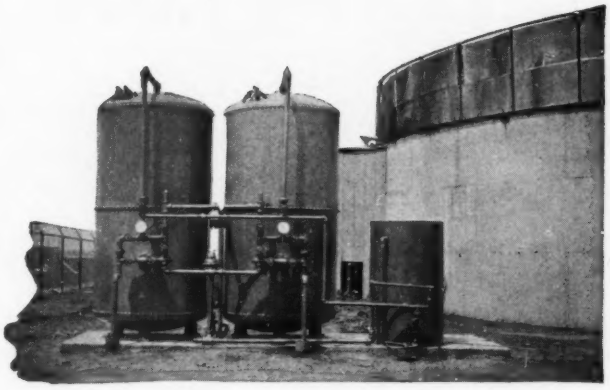
LOCAL OFFICES:

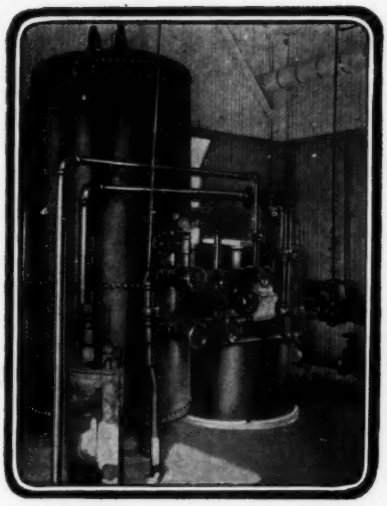
Birmingham, Boston, Chicago, Cincinnati, Cleveland, Dallas, Denver, Havana, Kansas City, Mo., Los Angeles, New Orleans, Philadelphia, Phoenix, Pittsburgh, Portland, Ore., Salt Lake City, Seattle, San Francisco, Vancouver

97

HARD WATER

Lowers Cooling Efficiency





HEAT and cold are always trying to strike a balance. They will—unless something interferes. With cooling coils, this "something" is scale.

Hard water is the cause of all this trouble. The remedy is to eliminate the scale forming salts.

In the Mid-Continent field and on the coast a number of refineries are using Paige-Jones rapid rate, upward flow Zeolite Softener for rendering harmless the water used for cooling coil purposes.

Hard water was a problem in these plants, but not so any longer. One refinery reports that among other advantages, they were able to save $1,000.00 anuually on condenser cleaning operations, because of the Paige-Jones Softener.

Are there opportunities for similar savings in your refinery by means of softened water? Why not go into this question with a Paige-Jones engineer?

High efficiencies and low operating costs of Paige-Jones rapid rate upward flow zeolite softeners are due to the following features:

Constant pressure from the softener.

Less pressure loss through the bed.

No backwashing of bed necessary.

Less salt for zeolite regeneration.

Less floor space for required capacities.

Paige-Jones originated and developed the rapid rate, upward flow zeolite softener.

PAIGE & JONES CHEMICAL CO., *Inc.*

General Sales Office, Technical Dept. & Works: HAMMOND, IND.
Executive Offices: 461 FOURTH AVE., N. Y. *Offices in Principal Cities*

PAIGE-JONES
WATER SOFTENING

ZEOLITE AND LIME SODA SOFTENERS · PRESSURE SAND FILTERS ·
BOILER FEED WATER TREATMENTS · HOUSEHOLD WATER SOFTENERS ·

Mention Where You Saw the Advertisement

The M. W. KELLOGG CO.

Offers its services in the design, manufacture and erection of complete oil refineries, or any part thereof.

A few of our customers are:

Standard Oil Co., of Indiana.
White Eagle Oil & Refining Co.
Lincoln Oil & Refining Co.
Simms Oil Co.
Globe Oil & Refining Co.
Panhandle Refining Co.

We ask the opportunity of quoting on your refinery requirements.

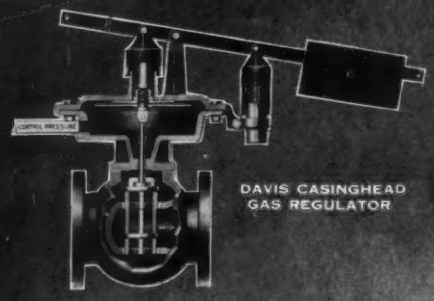
The M. W. KELLOGG Co.

7 Dey St., New York City

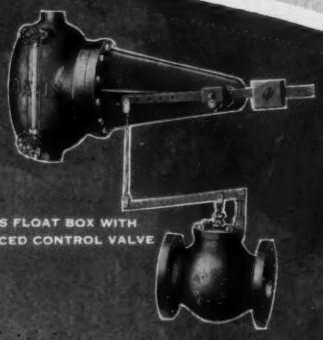
Branch Offices:
700 Baltimore Ave., Kansas City, Mo.
444 Market St., San Francisco, Calif.
1019 Hellman Bank Bldg., Los Angeles, Calif.

Mention Where You Saw the Advertisement

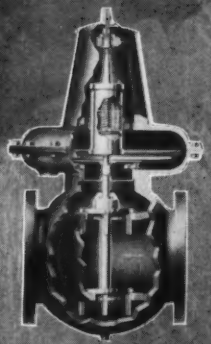
DAVIS REGULATORS



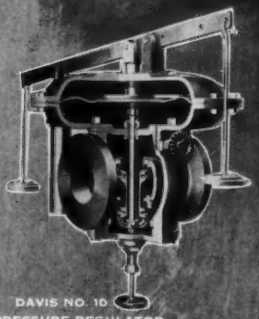
DAVIS CASINGHEAD GAS REGULATOR



DAVIS FLOAT BOX WITH BALANCED CONTROL VALVE



DAVIS SUPERSENSITIVE RELIEF VALVE



DAVIS NO. 10 GAS PRESSURE REGULATOR

Sales and Service

WESTCOTT & GREIS
MEASUREMENT AND CONTROL

Dallas TULSA Los Angeles

Do your cleaning the SAFE economical Oakite way!

Oakite Service Men, cleaning specialists, are located at

Albany, Allentown, Pa., Altoona, Pa., *Atlanta, Ga., *Baltimore, Birmingham, Ala., *Boston, Bridgeport, *Brooklyn, Buffalo, Camden, Charlotte, N. C., *Chicago, *Cincinnati, *Cleveland, *Columbus, O., *Dallas, *Davenport, *Dayton, *Denver, *Des Moines, *Detroit, Erie, Pa., Flint, Mich., Fresno, Cal., *Grand Rapids, Harrisburg, Hartford, *Indianapolis, *Jacksonville, Fla., *Kansas City, *Little Rock, Ark., *Los Angeles, Louisville, Ky., Memphis, Tenn., *Milwaukee, Minneapolis, *Montreal, Newark, Newburgh, N. Y., New Haven, *New York, *Oakland, Cal., *Omaha, Neb., *Philadelphia, *Pittsburgh, Portland, Me., *Portland, Ore., Providence, Reading, *Rochester, Rockford, Rock Island, *San Francisco, *Seattle, *St. Louis, South Bend, Ind., Syracuse, *Toledo, *Toronto, *Tulsa, Okla., Utica, *Vancouver, B. C., Williamsport, Pa., Worcester, Little Rock, Ark., Pa., Worcester.

*Stocks of Oakite materials are carried in these cities.

PRODUCERS, refiners and marketers will find it pays to use OAKITE materials and methods for cleaning—

Storage tanks	Drums	Filter cloths
Tank cars	Barrels	Salvage parts
Tank steamers	Cans	Pipe fittings
Motor trucks	Test bottles	Tools

For OAKITE cleaning methods are the SAFEST! Also the most economical to use.

OAKITE materials are non-inflammable, non-combustible, non-explosive. Fire hazard, which is ever present in cleaning with inflammable distillates is entirely eliminated!

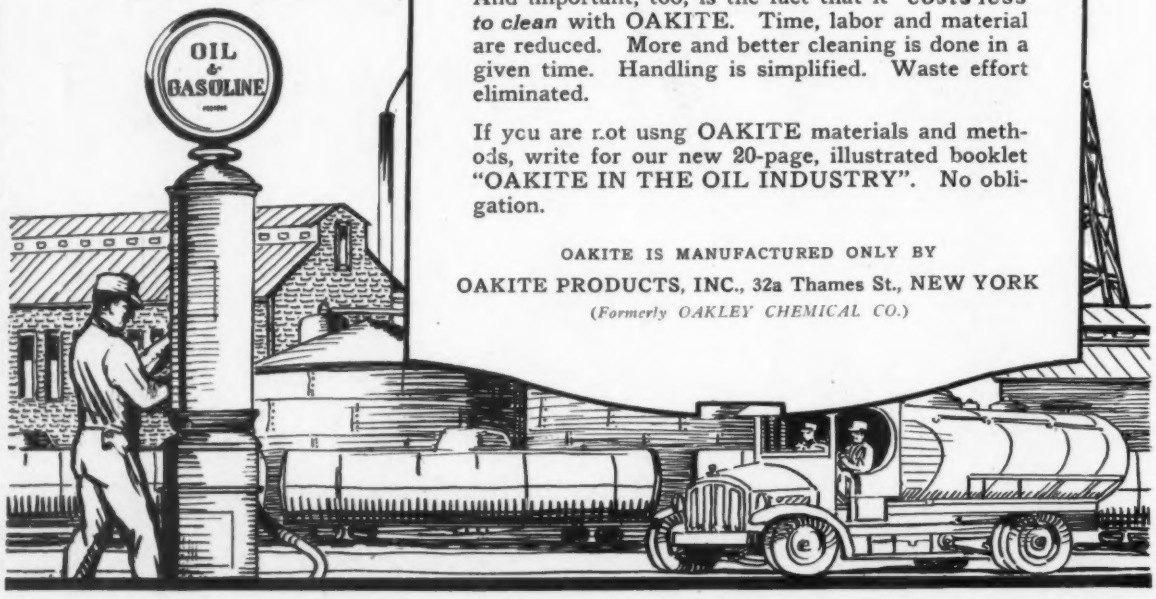
And important, too, is the fact that it ***costs less to clean*** with OAKITE. Time, labor and material are reduced. More and better cleaning is done in a given time. Handling is simplified. Waste effort eliminated.

If you are not using OAKITE materials and methods, write for our new 20-page, illustrated booklet "OAKITE IN THE OIL INDUSTRY". No obligation.

OAKITE IS MANUFACTURED ONLY BY

OAKITE PRODUCTS, INC., 32a Thames St., NEW YORK

(Formerly OAKLEY CHEMICAL CO.)

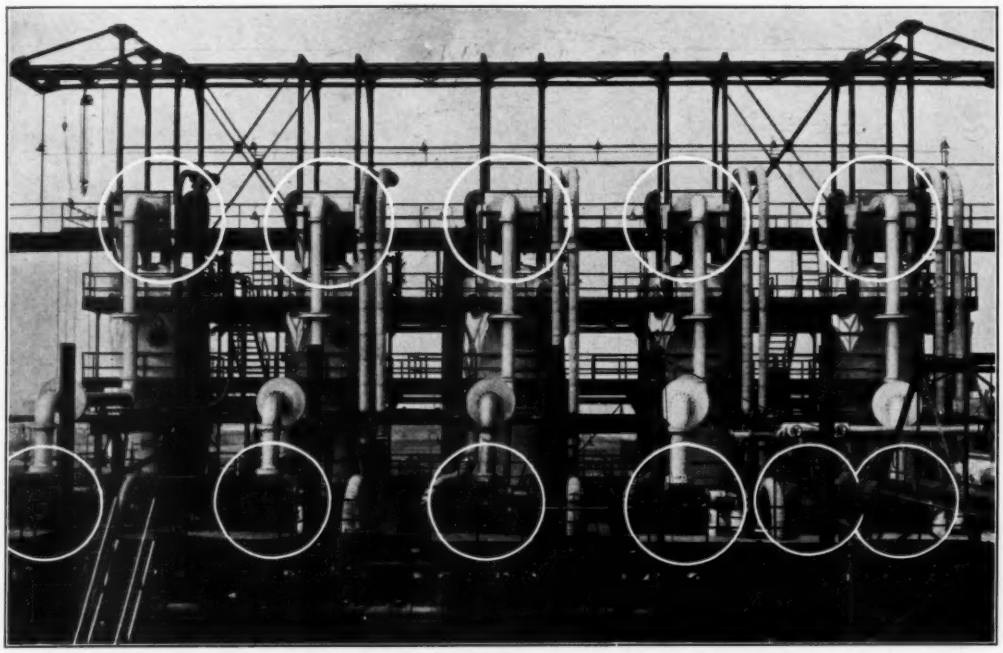


OAKITE

TRADE MARK REG. U.S. PAT. OFF.

Industrial Cleaning Materials and Methods

Mention Where You Saw the Advertisement



The Famous "Battery A"

Ross Equipped

With

5 — 1500 sq. ft. Partial Condensers
2 — 1400 sq. ft. Heat Exchangers
7 — 750 sq. ft. Heat Exchangers
2 — 630 sq. ft. Gas Oil Exchangers.

All having removable tube bundles

A year of satisfactory, successful operation shows that good judgment was used in the selection of this equipment.

Partial Condensers.
Heat Exchangers.
Evaporators.
Guided Expansion Joints.

Vacuum Equipment for Lubricating Oil Stills

Ross Heater & Mfg. Co.

BUFFALO, N. Y.

Representatives in all principal cities

NATURAL GASOLINE

Good motor fuel must be volatile . . non-detonating . . . even burning.

The easiest way to secure maximum volatility, and at the same time improve the non-detonating quality of refined gasoline, is to put back into it the fractions which have escaped from the crude in the process of production by adding the proper percentage of

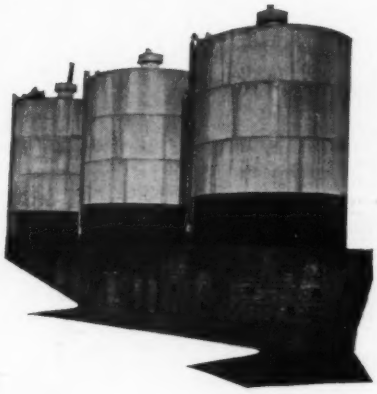
NATURAL GASOLINE

Natural gasoline is concentrated volatility . . . . belongs in refined gasoline to make a perfectly balanced fuel.

The program of research conducted by the Association of Natural Gasoline Manufacturers has developed many interesting motor fuel facts. Bulletins covering this work may be had, free, by writing the Research Department, Association of Natural Gasoline Manufacturers, Cosden Building, Tulsa, Okla.

ASSOCIATION OF NATURAL GASOLINE MANUFACTURERS

RESEARCH DEPARTMENT ASSOCIATION OF NATURAL GASOLINE MANUFACTURERS



STOP the tremendous Corrosion losses in YOUR REFINERY

REFINERY CORROSION:

—may be divided into the following classes: Acid, High Temperature, Atmospheric and Underwater; and for each one of these MetaLayeR (the "putting-on" tool) can be very effectively and economically used.

Durability of the following equipment can be greatly increased by applying thereon, coatings of sprayed molten metal: Sweater Pans, Still Tube Sheets, Separators, Tanks, Vats, Condensers, Connecting lines of Fractionating Stills, Agitator Tanks and Covers, Tank Cars, Oil Tanker Bulkheads, Pipe Fittings, etc., etc.

WHAT IS METALAYER?

Briefly, MetaLayeR is a Process and Apparatus which applies, either in the shop or field, a coherent attached or separable coating of any of the commercial metals on any substance, whether inflammable, vitreous, fibrous, metallic, conducting or insulating, regardless of size or location.

IS METALAYER NEW?

No, it has been used for years with great success, both in this Country and Abroad, for applying: Protective Coatings; Adding metal to increase dimension or weight, or to alter shapes; Filling-in sand holes, shrinks or other defects in castings; Correcting errors due to mis-machining, etc. In fact, over 1,500 industrial concerns are now using it for such classes of work.

CONVINCE YOURSELF OF ITS VALUE:

Write for the METALAYER BOOK,—or better still, if you have an immediate troublesome problem, it will pay you to come to Philadelphia and see MetaLayeR in operation,—it may mean the saving of thousands of dollars for your Company.

METALS COATING CO. of AMERICA

Main Office and Demonstration Plant

495-497 North Third St., Philadelphia, Pa.

CHICAGO CLEVELAND

Berlin and Hamburg, Germany

Please send me a copy of the **MetaLayeR BOOK** by return mail, gratis.

Mr. ..... Title .....

Co. Name ..... Street .....

City ..... State ..... Note: I am particularly interested in coating .....

R-4

Fuel oil *available for sale as fuel* in the Mid Continent field shows a decrease for the first 10 months of 1926 as compared with 1925

This is mainly due to the more valuable use of fuel oil for direct conversion into good Knoxless-Pullsmore gasoline by the Dubbs Process in one operation instead of selling it to users of industrial fuel

Far-sighted refiners feel that fuel oil supplies available for sale as fuel will be still further curtailed and will command higher prices in relation to crude, but will always be substantially below gas oil in price—mainly because there will always be about three

times as much fuel oil as there is gas oil in each barrel of crude

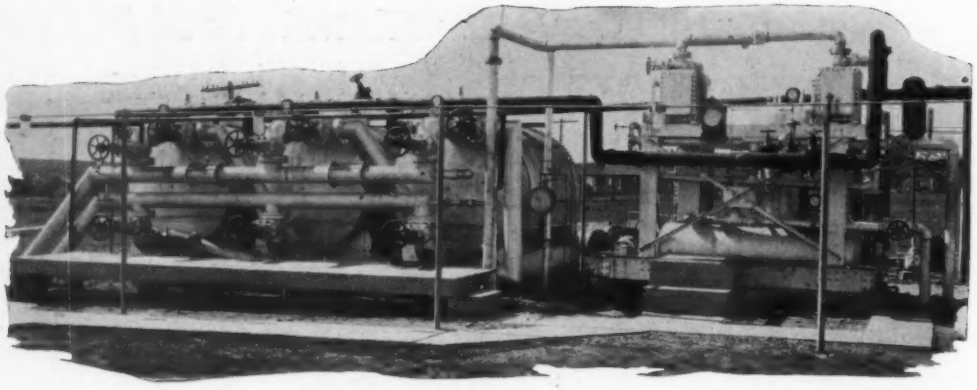
This definite trend only serves to emphasize the advantage of using the Dubbs Cracking Process

But if you must *temporarily* crack gas oil, do it at lowest cost per gallon of gasoline with the Dubbs Process

Universal Oil Products Company
Owner of the Dubbs Process
310 South Michigan Ave
Chicago, Illinois

CHAR process

—Of Gasoline Recovery—



When gasoline prices are low the Higher Efficiency *of a Charcoal Plant combined with* Lower Operating and Maintenance Cost *will keep you operating at a profit. The extra earning power is always there, but it is more evident in the pinches.*

GASOLINE RECOVERY CORPORATION
Charleston, W. Va.

TULSA
423 Wright Bldg.

LONG BEACH
Box 321

COAL

Mention Where You Saw the Advertisement

AT YOUR CALL

a tank car
Or a
train load
OF NATURAL
GASOLINE

CHESTNUT & SMITH
CORPORATION
Tulsa, Oklahoma

Mention Where You Saw the Advertisement

"MY TANKS!"

You will sleep peacefully if your tanks are Oceco equipped

Install OCECO VENT UNITS—for protection against fire —and worry.

This equipment has thoroughly demonstrated its value as a means of fire protection through years of service the world over. *Also reduces evaporation, thereby soon paying for itself.*

Ask for complete information.

2" Type B Vent Unit

The Oil Conservation Engineering Co.

Headquarters for Tank Equipment.

877 Addison Road **Cleveland, Ohio**

Engineering and Sales Service at:

25 Broadway, New York
O-S Building, Casper, Wyo.
417½ So. Boulder St., Tulsa, Okla.
Box 552, Beaumont, Texas
Neilan, Schumacher & Co., Los Angeles, Cal.

10" Type B Vent Unit

OIL TANK OCECO EQUIPMENT

SAVES EVAPORATION AND PREVENTS FIRE

BANROC JACKET

BANROC PRODUCTS

1. Adaptable
2. Flexible
3. Permanent
4. Reclaimable
5. Efficient
6. Economical

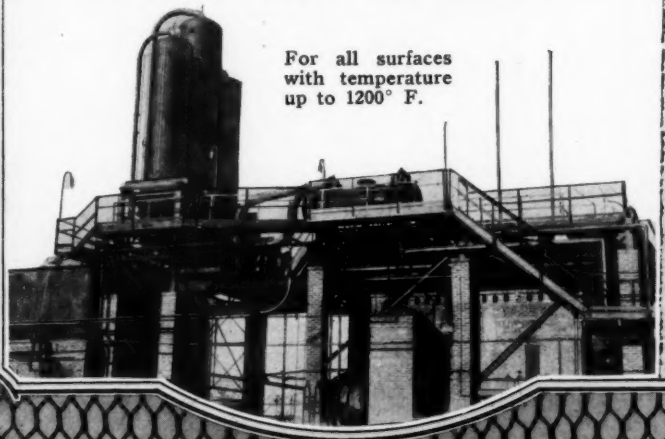
6. ECONOMICAL

Tests, made by some of the largest refiners in the country, prove BANROC JACKET the most economical type of insulation made.

The cost of Banroc is lower at first—positively lower in the end; you're buying the best.

If you want to know how BANROC insulation fits your particular needs—there's an installation engineer near you whose business it is to know insulation, and BANROC. Get in touch with him—we'll send you his name on receipt of a post card. Write for catalog 24-R.

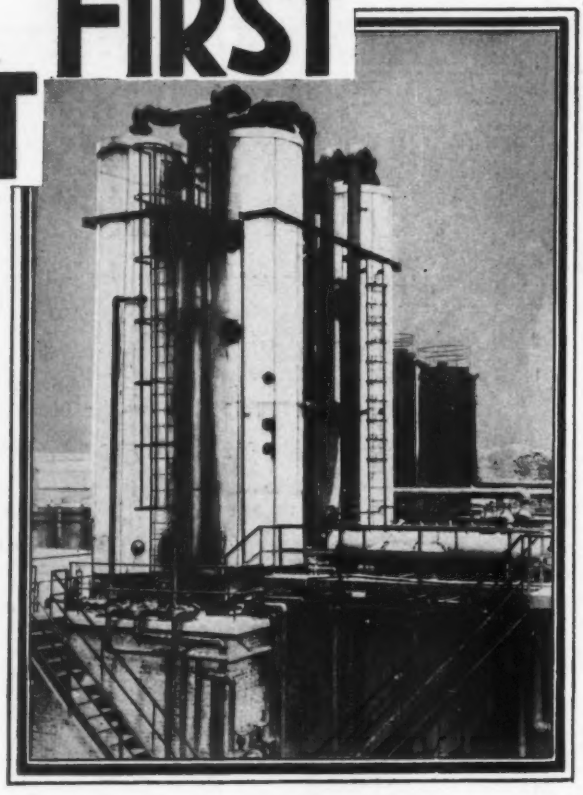
B A N R O C J A C K E T
100% FIREPROOF INSULATION



For all surfaces with temperature up to 1200° F.

BANNER ROCK PRODUCTS COMPANY
ALEXANDRIA, INDIANA
REPRESENTATIVES IN ALL PRINCIPAL CITIES

LEAST FIRST COST FOR -



The Badger Systems and Equipment for fractionating petroleum are furnished by the oldest and largest builder of efficient distilling apparatus in the United States.

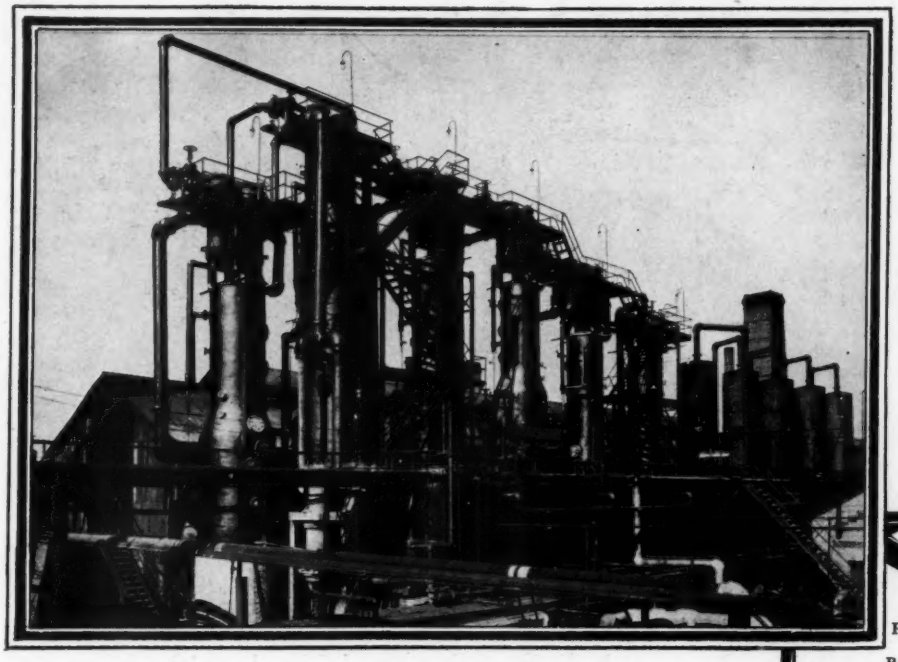
Fractionating Towers and Systems

FRACTIONATION

E·B·BADGER & SONS COM

NEW YORK — ANN ARBOR

MAXIMUM YIELDS — MINIMUM OPERATING EXPENSES



A guaranteed Badger plant costs less, for the same results, than substantially any other system. Many of the largest refiners know this.

Badger Systems are the result of extended practical experience in many refineries, thorough and careful research; and the most efficient engineering.

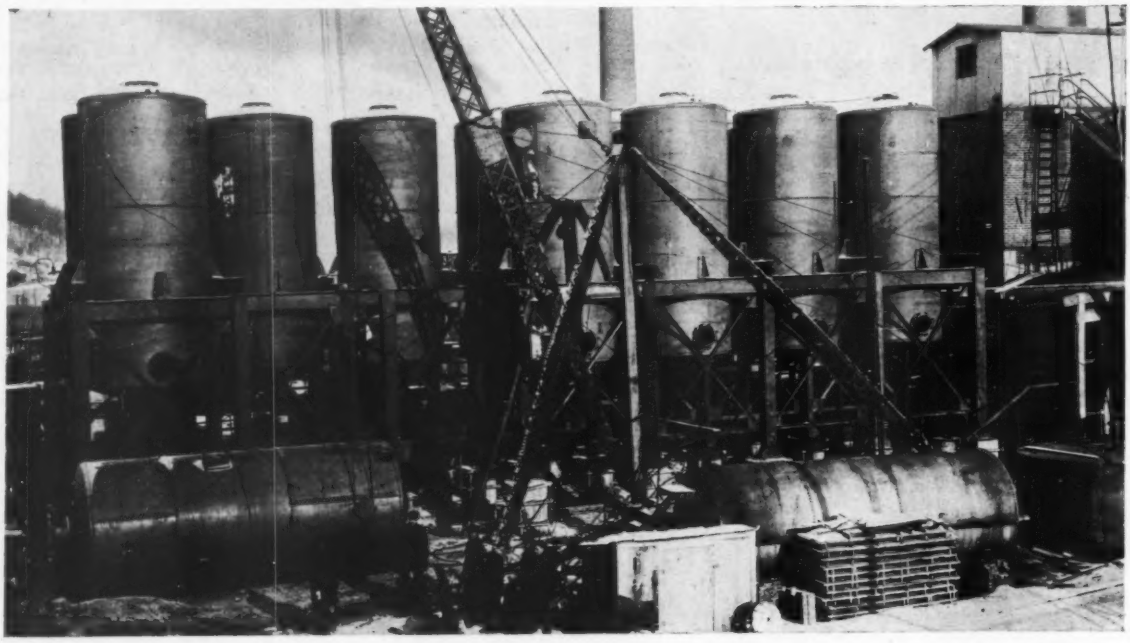
Pipe Stills, Topping Plants, etc.

MAGNOLIA PETROLEUM CO., OF TEXAS
ROXANA PETROLEUM CORP.
CRAIG OIL CO.
FREEDOM OIL WORKS CO.
WHITE STAR REFINING CO.
GULF REFINING CO.
SKELLY OIL CO.
PHILLIPS PETROLEUM CO.
PIERCE PETROLEUM CORP.
TIDE WATER OIL CO.
ANGLO-PERSIAN OIL CO., LTD.
EMPIRE REFINERIES, INC.
MARLAND OIL CO.
McMAN OIL & GAS CO.
ASSOCIATED OIL CO.
BARNSDALL CORP.
HUMBLE OIL & REFINING CO.
TIDAL REFINING CO.
STANDARD OIL CO. OF N. J.

EQUIPMENT

PANY · BOSTON · MASS ·

KANSAS CITY — TULSA



Hammond Filters with Fulton Patented Heads with Removable Non-Corrosive Monel Metal Screen. A Labor Saver doing away with old fashioned methods. Made in Diameters 5 to 10 feet and heights 10 x 30 feet. Names of users on request.

Our Bulletin No. 300 describes these Filters.

Our Bulletin No. 200 covers storage tanks from 300 to 80,000 barrels, and Bulletin No. 100R covers Horizontal Tanks from 1600 to 24,000 gallons. We make a specialty of furnishing steel tanks knocked down for domestic or export.

Erection men always available.

HAMMOND IRON WORKS

WARREN, PA.

Manufacturers and Exporters of Steel Tanks and Steel Plate Construction

(New York Office: 17 Battery Place—Telephone 0060)

Vol. 6, No. 4

APRIL, 1927

The REFINER

AND NATURAL GASOLINE MANUFACTURER

Edited Monthly at Tulsa, Oklahoma

GRADY TRIPLETT, *Editor*

TABLE OF CONTENTS

VAPOR PHASE REFINING BY MEANS OF THE GRAY CATALYTIC TOWER 51
By Gus S. Mitchell

PREFERENTIAL USES OF PETROLEUM, ESPECIALLY GAS OIL..... 54
By Arthur Knapp

CONTACT TREATMENT OF GASOLINE WITH CLAY..... 55
By O. J. Clark and A. M. Gundelfinger

CONTACT CLAY FILTERING FOR LUBRICATING OILS..... 57
By George Reid

COLOR OF LUBRICATING OIL IN ACID STAGE..... 59
By H. L. Kauffman

TUBE STILLS EXACT HIGH YIELD IN SKIMMING PRACTICE 61
By George Reid

ELIMINATION OF WILD FRACTIONS BY RE-CYCLING DURING MANUFACTURE 64
By Alexander B. Morris

THERMODYNAMICS OF SOME REFINERY PROBLEMS..... 66
By J. T. Hayward

GASOLINE PLANT OPERATORS HOLD TWO TEXAS MEETINGS 68

WATER TREATMENT AT GASOLINE PLANTS..... 70
By Otto Peters

GASOLINE PLANT OPERATION..... 72
By C. A. Edwards

A LONG RANGE COOLING TOWER FOR A REFINERY..... 74
By Louis A. Phillips, M. E.

THE MICROANALYSIS OF LUBRICATING OILS..... 78
By G. Myerheim and Fr. Frank

CORROSION OF PRESSURE STILL EQUIPMENT..... 83
By Gustav Egloff and Jacques C. Morrell

JERRY SPEAKS HIS MIND ON BOILERS..... 90
By J. A. Cruze

DEALING IN PERSONALITIES 96

PLANT ACTIVITIES 111

ABSTRACTS OF REFINING TECHNOLOGY..... 113

RECENT REFINERY PATENTS 118

Published Monthly by GULF PUBLISHING COMPANY
Copyrighted, 1927

R. L. DUDLEY, *President* — A. L. BURNS, *General Manager* — SPENCER W. ROBINSON, *Editorial Director* — J. KENT RIDLEY, *Managing Editor*

Editorial Office: 214-218 Atco Building, Tulsa, Oklahoma

Office of Publication: 1716 Dallas Avenue, Houston, Texas

NEW YORK: Room 832, 250 Park Avenue, R. P. Swinsky, Manager. *PITTSBURGH*: 510 Park Bldg., W. W. Pigue, Manager. *CHICAGO*: 476 First National Bank Bldg., O. R. Waller, Manager. *LOS ANGELES*: 1201 Haas Bldg., Wm. V. Gross, Manager. *TULSA*: 214-218 Atco Bldg., J. F. Carter, Jr., Manager. *FORT WORTH*: 203 W. T. Waggoner Bldg., H. H. King, Manager. Single copies 20 cents. Domestic Subscription price, $1.00 a year. Foreign Subscription price $1.50 a year. Advertising rates upon application.

For Strong and Dependable Refinery Valves

SPECIFY KEROTEST

Kerotest Valve Series 150

150 lbs. working pressure at 750° F.

250 lbs. working pressure at 100° F.

Kerotest Valve Series 300

300 lbs. working pressure at 750° F.

700 lbs. working pressure at 100° F.

—Six Standard Kerotest High Pressure Valves That Cover All Pressure and Temperature Requirements of Steam, Oil, Water and Gas.

1—Series 150	150 lbs. pressure at 750°
2—Series 250	250 lbs. pressure at 750°
3—Series 300	300 lbs. pressure at 750°
4—Series 400	400 lbs. pressure at 750°
5—Series 600	600 lbs. pressure at 750°
6—Series 900	900 lbs. pressure at 750°

Made of tough, close grained ilmenite electric steel—strong and dependable for valve service.

Trimmed in any special metal specified including:

Monel, Bronze, Nickel, Chrome Nickel, Stainless Steel, Carbon Steel, etc.

Complete technical information and recommendations, based on years of experience in high pressure line problems may be obtained upon request.

WRITE FOR THE KEROTEST FOLDER

Kerotest Manufacturing Company

2525 Liberty Avenue

PITTSBURGH PENNA.

No Solution Apparent

OF itself a period of plant operation at financial loss is a serious matter. When it passes without leaving a solution for avoiding future periods of similar nature, it is more serious.

This condition fits the independent refining industry of the Mid-Continent. Indications are that gasoline prices f.o.b. Mid-Continent points, as well as other sections, will rise slowly, having been through a few weeks where the price did not equal cost of charging stock, plus manufacturing and selling.

But if this has left any evidence whereby independent refiners will avoid future depressions, there is nothing to indicate it. Apparently the attitude among refiners is that prices will slowly reach a level that will allow profitable operation.

Beyond that the prospect is for a recurring condition, when the amount of gasoline again will exceed needs, causing a lowered market to the point where operating losses will slacken gasoline output until prices will advance again to bring back opportunity for profit.

It can not be charged that the independent refiner has failed to strive to prevent these conditions. No problem has had more serious consideration by the individual refiner.

Some have reached the mental stage of desperation. They seem convinced that the independent refiner is between two merciless millstones, from which there is no escape. But this can not be true, unless the economics of the petroleum industry do not allow the existence of the independent refiner.

But the independent refiner, as a class, is not converted to this attitude, for he is not bent on abandoning his business. He is determined to continue his business, but he does not know how to avoid the recurrence of a period when he will sell his gasoline below its cost.

Lessons of the past have been sufficiently drastic to teach the independent refiner that he need not look to other divisions of the petroleum industry for aid. Crude oil producers are going to charge the refiner as much as the traffic will bear for raw material. Jobbers are going to buy at the lowest possible figure and they are not going to be rushed in fear of any sort of shortage.

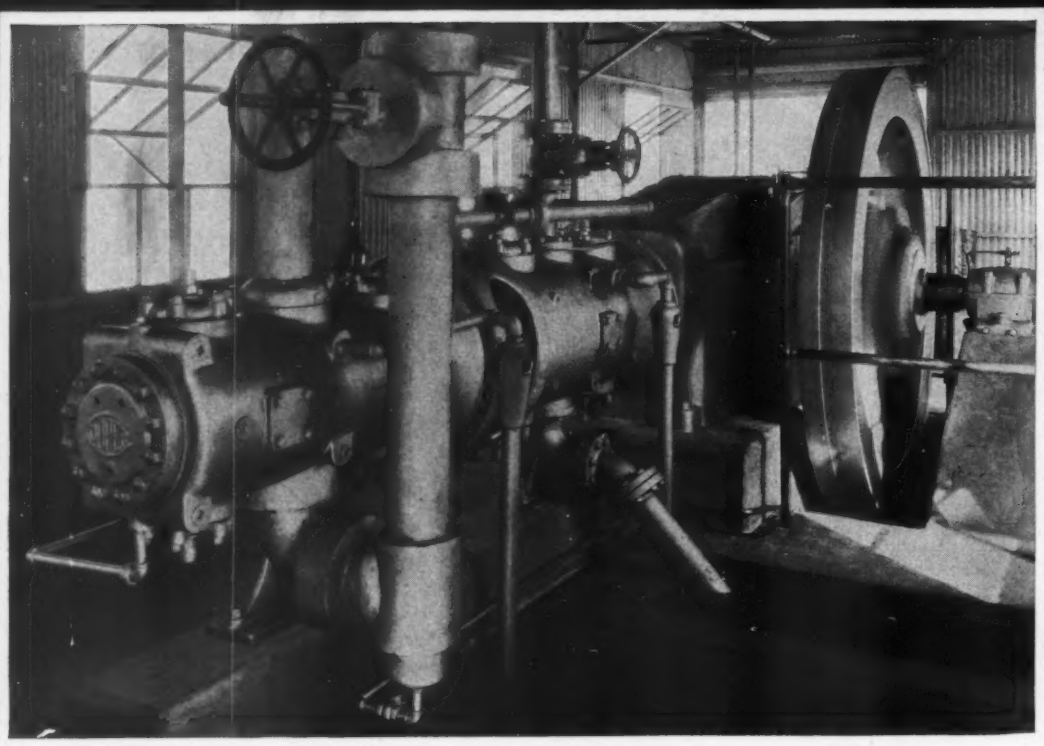
The two millstones have not changed and they offer no promise of change. Any change in what this economic mill turns out must come through change in the grist that goes into the hopper.

That brings the solution down to an individual matter. To class the problem as one deserving individual solution does not offer a remedy. It offers only an idea.

In defense of it, there are a few instances where refiners have found individual action valuable.

Just one fact can be set down. Only action will bring a solution. Words are worthless.

Grady Gilbert



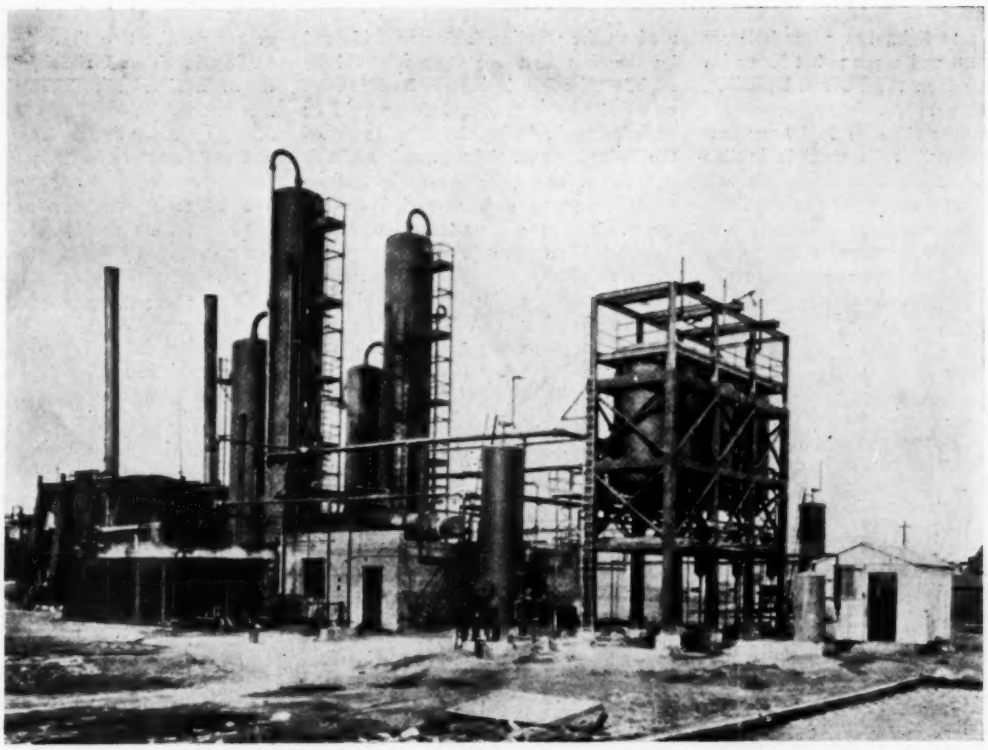
A Cooper Type-80 single gas engine compressing air for an air lift installed by the Barnsdall Oil Company near Okmulgee, Oklahoma.

If it's an air lift — better use a Cooper—

LET'S consider this question of compressor equipment for oil field air lifts on a straight business basis. Very often the increased production from one well pays for the compressor installation in from three to eight days. Then why in the name of everything that is sensible should anyone increase his chances of losing some of that production by selecting anything but the very best compressor equipment. Judging from the number of Cooper air lift installations that are being made, oil field operators are following this same line of reasoning. There are numerous details in the design and construction of Cooper gas engines and compressors which make them better adapted for any service where "hours on the load" is the important factor. Let a Cooper representative acquaint you with these advantages.

The C. & G. Cooper Company, Mt. Vernon, Ohio

1605 Kirby Bldg., Dallas
604 Kennedy Bldg., Tulsa
649 South Olive St., Los Angeles



GRAY EQUIPMENT COMBINED WITH CRACKING EQUIPMENT AT BARNSDALL, OKLAHOMA.

Vapor Phase Refining by Means of Gray Catalytic Tower

By GUS S. MITCHELL

THE Gray process for vapor phase refining of pressure distillate or pressure gasoline is not at all new to the petroleum industry, but in regard to plant installations it is yet in its infancy. The refining companies have been quite reluctant, however, in taking up this new process since the first commercial installation was put in operation a little more than two years ago and there are now in operation, or soon to be in operation, 16 such plants located in the United States and four foreign countries. It may well be said that this process of vapor phase refining by the use of Fuller's earth in what is known as a Gray catalytic tower is marking a new era in this particular branch of petroleum refining.

It is interesting to glance back over the history of the refining of light distillates and note some of the different methods that have been in use. During the primary development of the petroleum industry the removal of color was attempted by the use of caustic soda and lime, but this, however, met with little success. Subsequent treatment with hydrochloric acid was then resorted to, but with little improvement on the first method. At that time (1857) sulphuric acid was being used in the coal industry for the refining of kerosene and the method was therefore borrowed by the petroleum industry, and is the most common refining method today. The sad part about the story is, however, that there was always an ample supply of sulphuric acid on hand at the refinery and whenever there was a new product to be treated the refiner immediately experimented with his "old standby," sulphuric acid. As a result he usually met with at least moderate success, and since the acid could be bought cheaply the method was accordingly adopted. Since the refiner could thus "get by," and for want of a better method, he continued his old practice for the refining of cracked distillates. Modern methods, however, are now breaking away from the old practice and diligent research has now evolved this new process of vapor filtration, which apparently is adapted to the particular needs of this class of refinery products. There have been a number of other methods devised for treating of light oils, some of which make use of different adsorptive materials, but the simplicity of the Gray installation has meant as much as anything else to the success of the process.

*Ind. Eng. Chem., Vol. 16, No. 9, p. 913. Sept., 1924.

Theory of Process

The theory of the process can best be explained by an extract from an article on "Catalytic Treatment of Cracked Distillates in the Vapor Phase,"* by Gray and Mandelbaum, the former being the patentee of the process. "The process is based on the greater reactivity of the objectionable diolefins and similar unstable substances occurring in the cracked oils. When vapors containing these substances are passed through an adsorption catalyst, they are caused to polymerize into higher boiling products, which, although not retained by the catalyst, can be separated from the body of the distillate by virtue of the difference in boiling point. These polymers are usually dark colored viscous oils or resinous solids, some of the oils showing excellent physical characeristics for lubricating oils. There is evidence that the reaction is exothermic. The distillate, after the unstable constit-

uents have been removed in this way, is more stable to light, has a much lower gumming test, and a somewhat lower iodine number than the untreated product. The loss due to the formation of the polymers ranges from 0.1 to 1.0 per cent of the distillate. It is possible in this way to produce satisfactory gasoline and burning oils from pressure distillates without acid treatment. The most convenient catalyst of those suited to the purpose is Fuller's earth, because of its wide refinery application."

The first commercial installation dates back only to September, 1924, the location being at the Barnsdall Refineries, Inc., refinery at Barnsdall, Okla. This installation consisted of a single tower connected to a batch rerun still then in operation at the refinery. At that time a pressure distillate was being acid treated and then rerun for the pressure gasoline. The Gray tower was installed to treat the distillate in vapor form and eliminate the acid treatment. This installation will not be described in detail here, since this batch or semi-continuous method differs but little from that used in connection with the cracking stills. The diagram shown in Fig. 1 shows the arrangement of the tower. The Gray tower (C) is practically the same as the small size, described later in this article.

To operate, chamber C of the tower was charged with six tons of No. ½ clay, the clay being hoisted to the top of the tower in sacks by means of a gasoline engine and then dumped by hand. Pressure distillate was then charged semi-continuously to the rerun still. The vapors from the still went first to a Bell bubble tower, from there upward through the outer shell (C-1) of the Gray tower, down through the clay bed (C) into the bottom compartment (C-2), and out through the condenser box (F) to the run-down tank. The reflux or condensate that collected in the outer shell (C) was drawn off through pot (D) and pumped back to the Bell tower. The polymers which collected in compartment (C-2) were drawn off in pot (E) and pumped back to the still. The pressures while operating were naturally low, that on the still being three and one-half to four pounds, the Bell tower two and one-half to three pounds, and the Gray tower one and one-half to two pounds.

When the stream was cut into kerosene the vapors were by-passed and went directly to the Gray tower. Much inconvenience was experienced due to the fact that only one tower was installed, since at times the overhead would go off color in the middle of a run and at other times the clay would have to be dumped for fear it would not last through another run. However, had this previous method of cracking been continued, another tower would have been erected, since this should be included in a complete setup.

After losing its decolorizing value, the clay was blown with steam, the clay dumped, and the tower recharged with half clay. It was noticed in the runs that after the clay had lost its decolorizing value for kerosene it could still be used on the gasoline. This was evidenced by the fact that the stream would be slightly off color during the kerosene cut on some of the runs and then would be on color again during the gasoline cut of the following run. The operation of this installation was quite simple in that no excessive pressure was carried on the tower. The most important factor influencing efficient operation was the proper removal of the polymers to insure the gasoline stream against contamination. In all, the operation is much the same, aside from the pressure regulation, as that with the tower direct connected to the cracking stills and will therefore not be taken up any more in detail.

With Cracking Units

The Gray tower installation described in the following paragraph include three eight-ton towers used in connection with two 1000-barrel Cross units and two 16-ton towers in connection with one 2000-barrel Cross unit. The data has reference in most cases to the small units but just as well applies to the larger unit, since the operation and operating conditions are practically the same. One very characteristic feature that will be noticed throughout the installation is the flexible features and the automatic control regulation, thereby adding to the ease of operation.

A diagramatic sketch of the installation showing how the Gray tower is connected to the cracking towers is shown in Fig. 2. The Gray tower, known as the polymerizer, is of the same construction except for a few details as that shown in Fig. 1. After passing through the furnace tubes and reaction chamber, the oil and vapors come into the vapor tower (A). Here the residuum collects at the bottom and is drawn off while the vapors go to the bubble tower coming in on the sixth plate. Gasoline vapors are then taken off from the top of the bubble tower to the desired end-point. These vapors go direct to the polymerizer, and coming in through the inlet, as shown, follow a circular path upward through the outer chamber (C), then downward through the clay in the clay chamber (C), and out through the lower compartment (C-2) to the condenser and gas separator. There is partial condensation of the vapors in the outer shell and these are taken care of by means of an automatic stream regulator on a draw off line running to the pot, as shown, a constant level being maintained in the tower. The polymer line shown opens direct into the pot, the polymers being drawn off as they collect in lower compartment (C-2). The reflux and polymers are both drawn into pot (D) and from there into the accumulator tank (E). An electric pump connected to the outlet line on this tank is controlled by a mercoid switch and operates intermittently to pump the reflux and polymer fractions to the bottom of the vapor tower (A). The tower is equipped with a two-inch steam inlet line on the side of the outer shell for steaming out. Also a three-inch outlet steam line for steaming out connects on to the outlet vapor line and leads away to a pump. The arrangement of the vapor inlet and outlet on the polymerizer is best shown by the cross section of the tower in the upper right-hand corner of the flow sheet. The tower has a manhead at the top, through which the clay is charged. A manhead on the bottom and also about a 10-inch outlet, through which the clay is dumped. A safety valve, as shown at the top of the tower, is set at 50 pounds. The tower is equipped with thermocouples and pressure gauges for getting temperatures and pressures of inlet and outlet vapors.

Tower Specifications

The above outline and flow sheet, given in Fig. 2, show how the Gray tower is

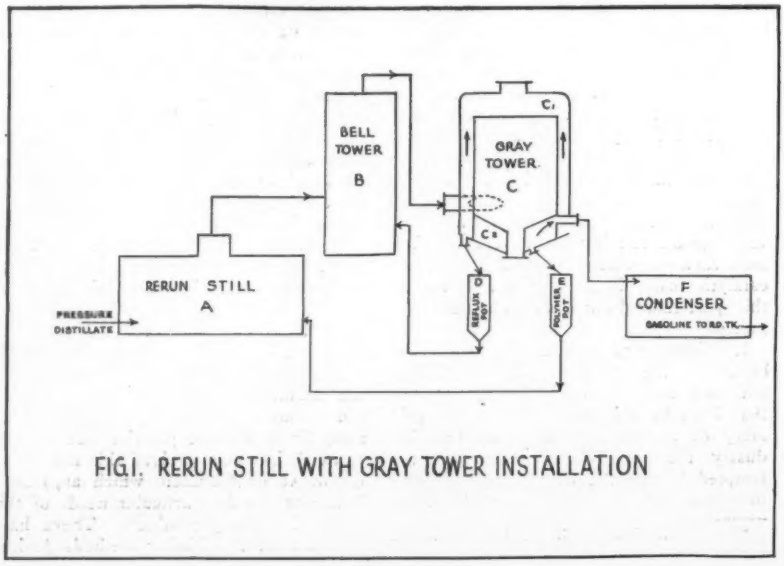


FIG. 1. RERUN STILL WITH GRAY TOWER INSTALLATION

tied into the operation of the cracking plant and give a general description of the component parts of the installation. Some details, however, are given below on both the small and large tower so as to give a more definite idea of the construction of the towers.

Capacity (tons), small tower, 8; large tower, 16.

Vapor line to tower, small tower, 4″; large tower, 8″.

Overall length of outer shell (including manhead and neck), small tower, 16′ 9¾″; large tower, 18′ 8″.

Diameter of outer shell, small tower, 8′ 10⅛″; large tower, 11′ 10⅜″.

Overall height of inner shell (including dish at bottom), small tower, 12′ 2½″; large tower, 12′ 5″.

Top of inner shell to top of dish (screen support), small tower, 10′ 8¾″; large tower, 10′ 8″.

Diameter of inner shell, small tower, 8′ ½″; large tower, 11′.

Vapor inlet (center) to bottom of dish, small tower, 3′; large tower, 4′.

Vapor outlet (center) to bottom of dish, small tower, 10″; large tower, 11″.

Working pressure at 450° F., small tower, 50 pounds; large tower, 50 pounds.

Screen support, small tower, 60-100 mesh perforated plate, ¾″ holes with 1¼″ centers; large tower, 3/32″ slotted plate, slots 50% of area of plate.

Screen, small tower, 18x200 mesh spiral weave aluminum screen; large tower, 24x 100 mesh spiral weave monel metal.

The towers are of riveted and welded construction and the outer shell is well insulated. They are tested at 75 pounds hydrostatic pressure and are made to withstand a working pressure of 50 pounds at 450 degrees Fahrenheit.

The polymer pots and accumulators have the following dimensions:

Reflux and polymer pot—
Diameter, small tower, 16″; large tower, 18″.
Depth of cylindrical portion, small tower, 4′; large tower, 4′ 10″.
Depth of conical portion, sfall tower, 6½″; large tower, 10″.
Accumulator—
Diameter, small tower, 3′; large tower, 4′.
Height, small tower, 6′ 6″; large tower, 6′ 6″.

Worthy of particular mention also is the vapor lines to the towers. On the two small units the vapor lines come into a manifold, which is so arranged that either still can be cut into any one of the three towers. Also in regard to the accumulator-pumps, there is one standby or spare pump that can be put in use in case of the other needs to be shut down for repairs. It is such features as these, coupled with the automatic controls, that count for ease of operation and assure having the Gray towers available at all times for treating the vapors.

The opeartion of the towers can be divided as follows:

1. Charging.
2. Bringing up to pressure.
3. Operation on pressure.
4. Shutting down.
5. Dumping.

The charging of the clay ordinarily is only a small matter in that it requires but little time. This factor of course depends entirely on the yield obtained from the clay. From the yields ordinarily obtained it would necessitate the tower being charged from once to four times a month. This would naturally not warrant very elaborate equipment for charging the clay. The clay therefore is sacked at the filter plant after being burned (only 60-90 mesh half clay is used and is hauled by truck to the cracking plant. The truck is equipped with a winch and this is used for hoisting the clay to the top of the tower. The clay is charged with one man at the winch, three men on the ground and three men on top. With this arrangement it requires two hours and a half to charge six tons of clay to the small tower and about twice that long to charge 14 tons to the large tower. After charging, the aluminum gasket is placed on the head, the manhead put in place and bolted, which only requires a few minutes.

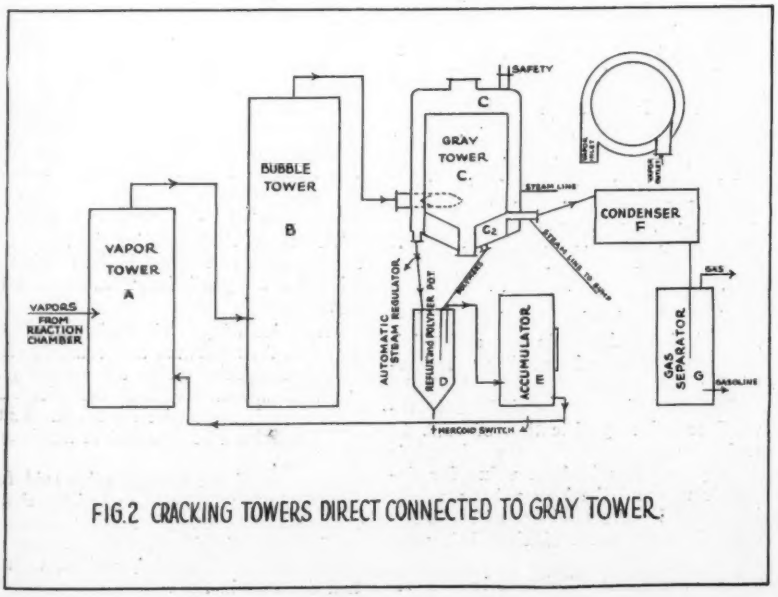


FIG.2 CRACKING TOWERS DIRECT CONNECTED TO GRAY TOWER.

Method of Operating

In bringing up to pressure, the vapors from the bubble tower are first sent direct through the condenser to the gas separator until the bubble tower reaches 300 degrees Fahrenheit. The vapors are then cracked into the Gray tower slowly, keeping the outlet vapor line closed until the pressure on the tower is up to normal, this being done to prevent channeling. When the vapors are cut into the tower the reflux and polymer lines are opened through the pot and accumulator to the slop tank until the tower outlet is 300 degrees Fahrenheit, which requires about an hour. This is done to assure the removal of all the water in the system, which comes from the steam that was used in steaming out and is not present in any large amount. The lines to the slop tank are then shut off, the automatic steam valve started operating and the level built up in the accumulator. The temperature on the bubble tower is next raised gradually from 300 degrees Fahrenheit to the normal working temperature of 325 degrees Fahrenheit, this operation requiring about an hour. The system is then held as close as possible to these conditions throughout the operation

There is one Gray tower operator to each battery of towers, it being his duty to watch the temperatures, pressures and stream color. Only a part of the readings are recorded hourly on the Cross still record sheet. They are as follows:

Pressures:
Vapor tower.
Bubble tower.
Gray tower (outlet).
Gas separator.
Temperatures:
Bubble tower.
Gray tower (inlet).

Aside from this the report shows the tests, including gravity, distillation and color, of three stream samples taken during the day. If the color drops, it is, of course, watched more closely until it is evident that the clay has lost its decolorizing value. Such color indication is usually taken as 25 Saybolt. Any irregularities are of course recorded on the report under remarks. The pressures through the system remain practically constant throughout the operation unless the still is operating abnormally. The temperatures, however, vary during part of the run. This, as explained earlier in the article, is due in part to an exothermic reaction caused by the action of the clay on the vapors. As shown by the results given below, this heat effect reaches a maximum when about 150 barrels per ton have been run through the clay. The heating then diminishes until the yield has reached about 500 barrels and then the temperature difference of outlet and inlet remains practically constant. This heating effect of course varies and is dependent on a number of factors, such as the particular clay used, composition of

(Continued on page 106)

Preferential Uses of Petroleum, Particularly Gas Oil

By ARTHUR KNAPP

THOSE who are inclined to undertake the role of the prophet are continually predicting a "shortage of petroleum with accompanying high prices." These predictions have been considered to be synonymous with the foretelling of a calamity. The time when this calamity would reach us has varied from a few months to a few years and the degree of severity predicted has varied from a mild business depression to a national disaster.

The industry has already passed through numerous periods which were seriously predicted to be the limiting time in which petroleum could be produced in sufficient volume to meet all demands without a large increase in price. The only calamity which has happened so far has been to the oil industry, due to an over production and not to the consumers, due to a failure of the supply.

These predictions fail for many reasons. One of these reasons is the attempt to set up arbitrary standards of economic and uneconomic uses and to guess when these uses, which have been selected as uneconomic, will be eliminated by price. No use may be selected as uneconomic on any other basis than the opinion of the user as to the value received for the money spent. The element of the convenience of petroleum is a very large factor in its use and has a great influence on the opinion of the consumer as to the value received, although such convenience cannot always be expressed in actual dollars and cents.

There are no "Preferential Users" of petroleum products. Price and convenience make the selection of users and not an academic determination of what constitutes "legitimate," "preferential," or "economic" use by definition, by expression of opinion or by legislation.

The Determination of Trends

The trend of consumption of any petroleum commodity is a composite of the trend of use by a very large number of consumers. Predictions regarding petroleum in general or any particular commodity, would demand the study of the trend of consumption of the principal uses. Few, if any, of our prophets have undertaken any such studies and therein their prophesies fail.

The subject is so complicated that it is doubtful if the study of the composite consumption curve by a study of the detail consumption curves of various uses would yield results definite enough to be the basis of any predictions as to the trend of consumption of the entire commodity. This means that it is doubtful if long time prediction of the trend of consumption of petroleum commodities may be made. The study of the principal uses may lend some light, however, so that the future may not be entirely blank. Certainly there is a relation between the seasonal distribution of gasoline consumption and the sale of closed cars. There is a relation between the trend of consumption of bunker oil, fuel oil for railroad consumption, fuel oil for consumption by public utility power plants, volume of sales of house and building heating appliances and the trend of fuel oil consumption.

One of the principal factors which makes such studies uncertain of results in the determination of the price which will change the trend or limit the use of any particular class of consumer. It is difficult for any consumer of any commodity, whether gasoline, steel, wool, or eggs, to state what price is the maximum which may be paid at some future date. The changing value of the dollar, changes in the efficiency of manufacture, changes in design and many other factors may make it possible in the future to pay many times the price which is now considered to be the maximum price at which profitable operations may be continued.

Gas Oil

The use of gas oil by manufacturers of domestic gas has been classed as preferential by some and as non-essential by others.

Those who classify the use as preferential do so because domestic gas is classed very high among the essentials of modern life, also because the water-gas process is a very integral part of the gas manufacturing industry and its elimination means the readjustment of the economics of the production of cheap domestic gas.

Those who classify the use of gas oil in the manufacture of gas as non-essential are not familiar with the economics and technology of the manufacture of cheap domestic gas and think that coal gas may be readily substituted for water gas. The trend of the technology of gas manufacture is toward complete gasification of coal. In such a process, the gas produced is usually too low in heat value for domestic use and the heat value must be increased by the addition of some hydrocarbon, the most efficient being gas oil.

The consumer of domestic gas receives a value for gas oil used in enriching the lean gases which will not allow this use of petroleum to be arbitrarily classified as non-essential.

Trend of Gas Oil Use

Unfortunately the gas industry fails to appreciate the value of basic statistics and detailed figures regarding the use of gas oil by the industry are not available. The trend of consumption can be fairly well established, however.

The efficiency of use in the process of manufacture has been perfected to a point where 89 per cent of the oil used is recovered in some form of valuable product, so that maximum efficiency of use has been obtained and this element will have no effect upon the trend of future consumption.

The volume of oil used per unit of water gas manufactured is directly proportional to the heat value of the gas sold since the oil is added for the purpose of bringing the heat value up to a standard. The trend of the standard heat value requirements has been steadily downward for a number of years. This means that there has been a steady decline in the volume of gas oil necessary per unit of water gas manufactured.

There is, however, a minimum B. T. U. content for domestic gas beyond which the use becomes very unsatisfactory and uneconomical. This limit has been very nearly reached, so that the trend of the volume of oil per unit of gas manufactured is very nearly horizontal and will have little effect in changing the trend of gas oil consumption in the future.

This leaves two factors which will have the greatest influence on the future consumption of gas oil for gas making purposes, one is the trend of the consumption of domestic gas and the other is the so-called elimination price for gas oil. The trend of consumption of gas is rapidly approaching the curve of population which curve is well established.

The most vital question is then, the consideration as to what is the maximum price that the gas industry can afford to pay.

The price of gas oil during 1926 approached the maximum that could be paid by gas companies under the present gas rates. As a matter of fact, the price was high enough to restrict its use in plants which could not be operated at maximum efficiency.

Prices equal the average price paid for gas oil during 1926 will materially check the consumption for gas making purposes. An increase of price over the average of 1926 would probably bring about an actual decrease in the volume consumed.

Contact Treatment of Gasoline With Clay

By O. J. CLARK and A. M. GUNDELFINGER
Marine Refining Corporation

THERE is a great variety of clays in use in California for the treatment of gasoline. Some are merely put through a kiln for drying and then ground, while others are given, in addition, an acid treatment which leaves them slightly acidic. The latter clays owe a greater part of their treating values to their absorbed acid. As a rule, however, the treating properties of clays is a function of the amount of suface and capillarity presented as well as the absorbent ability peculiar to the specific physical nature of each clay. It is a known fact that all other things being equal, the greater the surface or the more finely divided, the greater will be the treating efficiency. There are many clays, however, which, although they present equal amounts of surface, vary widely in their treating quailties. The cause for this has not been definitely determined. There are some who believe the absorbing qualities to be a function of the physical nature of the clay and there are others who attribute it to traces of impurities on the surface. It is still, however, a matter of theory.

There are other factors which enter to inhibit or promote the treating qualities of clays. Of the former, the most outstanding is climatic condition. A clay which shows markedly absorbing powers also has a tendency to absorb moisture very strongly. As a general rule an absorbent substance shows a selective absorbtive power for substance of a higher critical temperature in preference over one of a lower critical temperature. The displacement of one absorbed substance by another, however, requires time and is dependent to a great extent on the concentrations. So, it is quite evident that a clay which is exposed to dampness will not be as effective as a comparatively dry one on account of the water which covers the surface. Such a condition necessitates the use of more clay and longer treatment, consequently, it is desirable from the standpoint of efficiency to store clay in a dry place.

Clays have been tried which were completely dried, but it is found that although the efficiency increases inversely with the moisture content up to a certain point, it decreases past that point. It seems that it is simpler to displace a slight amount of moisture than to displace absorbed air which is present when moisture is lacking. It is extremely difficult to wet a dry clay.

Value of Moisture

The value of moisture in clay is best exemplified in the treatment of lubricating oils. In this process, the oil and clay mixture is heated and stirred and as the temperature is raised a froth is formed on the surface which increases until the temperature reaches approximately 280 degrees Fahrenheit, when it immediately disappears. From then on it is useless to stir or heat any longer as the clay has taken up all the suspension it can. In this case the moisture serves as an indicator as well as an aiding factor for absorption. In fact within reasonable limits, the more moisture there is, the better will be the treatment. The heat aids in driving out the moisture and the oil is substituted and easily wets the clay.

Another undesirable condition which is sometimes met with and must be avoided is moisture in the gasoline subjected to clay treatment. Clay has the tendency to absorb moisture first and when present in sufficient quantities will cause the clay to agglomerate and form a mud which will clog the treating apparatus as well as ruin the treatment.

FILTER PRESS AND CLAY HOPPER IN CONTACT CLAY FILTRATION INSTALLATION. MARINE REFINING COMPANY, VERNON, CALIFORNIA.

In regard to conditions which aid the treatment of gasoline with clay, the writers are of the opinion that, in addition to the reverse of the above unfavorable conditions, the action of the clay is confined mostly to the absorption of colloidal particles. Whether this is the result of differences in electrical charges or the clogging of capillary spaces or a natural attraction, is not known. It is not even an established fact that the reaction is of a colloidal nature, but certain allied reactions seem to give it that indication. For example, the treatment of lubricating oils for color depends solely on the removal of colloidal asphalt by the clay. Then, too, in the method employed by the Marine Refining Corporation in agitating gasoline with a slight amount of 66 degree Be. sulphuric acid, allowing the sludge to settle, then giving a caustic wash without a water wash in between or afterward produces the following results: Any moisture present in the blending stock is fixed by the acid and drops out with the sludge. There is then left a dry gasoline with dissolved acid organic substances of the type RSO3H. The greater part of these compounds could be washed out with water, but that would consume time and loss of material in drawing off the water, which are both expensive and would leave the gasoline moist again.

Instead, the caustic solution is added, agitated and allowed to settle. This treatment fixes the above compounds in the general type RSO3Na which are insoluble in gasoline and the greater part of which drop out with the caustic and the remainder stays colloidally in suspension along with suspended sodium sulphate. The caustic solution is of sufficient concentration to settle out without leaving moisture in suspension. After thorough mixture with clay and filtration through a filter press, the gasoline comes out perfectly clear, free from sediment, 30 + Saybolt in color, negative to doctor test, negative to corrosion test, neutral and ready for blending into a finished product. This method has proven to be a time and labor saver. Then, too, it is not essential to use as much acid as is necessary when no clay is used becaue the clay will take out the coloring matter that is not touched by the insufficient supply of acid. In fact, if enough clay were used, gasoline could be treated out colorless without acid.

We have found from experience,

however, that clay will not remove sulphur compounds so a combination of clay and acid treatment is found more satisfactory. The fact that clay will remove coloring matter is almost proof enough of a colloidal reaction.

Difficulties Overcome

There are many good clays on the market and although there are many which we at the Marine Refining Corporation have not tried, the one which has given us the best results so far is mined in Death Valley. It is not an acid treated clay but merely kiln dried and ground to 200 mesh sizes. Its composition is principally hydrated magnesium silicate.

The problem of treating gasoline to a pure white color and keeping it in that condition while in a clear vision pump necessitated the devising of a treatment that would cope with the problems discovered to be of treating value, sulphuric acid, caustic soda and sodium plumbite were used extensively as a means of treating gasoline. Treating in this manner was a rather slow tedious process so when it became known that could be used and with only one treatment, giving a 25 + Saybolt color, the refiner saw a shortcut that could be used at a reduced cost and with less labor. At first the clay was added direct to the gasoline in the agitators, then pumped to settling tanks. It wasn't long until the finely divided clay particles appeared in the clear vision bowls and eventually settled in the carburetors. Many refiners abandoned this method while others started perfecting a method that would overcome this condition.

The using of a clay press proved to be the "Eureka" for treating, for it removed all of the suspended clay. As clay treatment alone will not suffice as was previously mentioned, it was necessary to devise a method which would combine treatment of acid, caustic and clay. By using a treatment of this nature, more unsaturated hydro-carbons are left in the finished gasoline which is desirable because of their anti-knock or non-detonating qualities.

Equipment Built

With all of these facts in mind, the Marine Refining Corporation of Los Angeles, California, designed and built a treating system which has proven satisfactory since its installation more than a year ago.

Agitators with a capacity of 1000 barrels are used to give the gasoline its acid and caustic treatment. It has been found necessary to give the gasoline a treatment with 66 degree Be. sulphuric acid varying from one-half a pound to three pounds per barrel, according to the nature of the gasoline to be treated. The gasoline is agitated with air until the acid "breaks." The air is then shut off and the sludge drawn off immediately, taking usually fifteen minutes to free it from the gasoline. Caustic soda, with a strength between 12 and 15 Be. gravity is then added and agitated for about ten minutes and allowed to settle for at least two hours. After drawing off the caustic, the gasoline gravitates to the press house, where it is treated and filtered.

The apparatus used to treat the gasoline consists of a device for bringing the gasoline in contact with the dry clay and thoroughly mixing it and keeping it in suspension till it reaches the press which is located on a platform built above the mixer. Clay is loaded into a hopper which extends from the platform to a belt conveyor, the path of which is through the bottom of the clay hopper. The belt conveyor has cross strips attached at equal intervals to hold a known amount of clay. The exact amount is controlled by a slide on the side of the clay hopper, through which the conveyor moves.

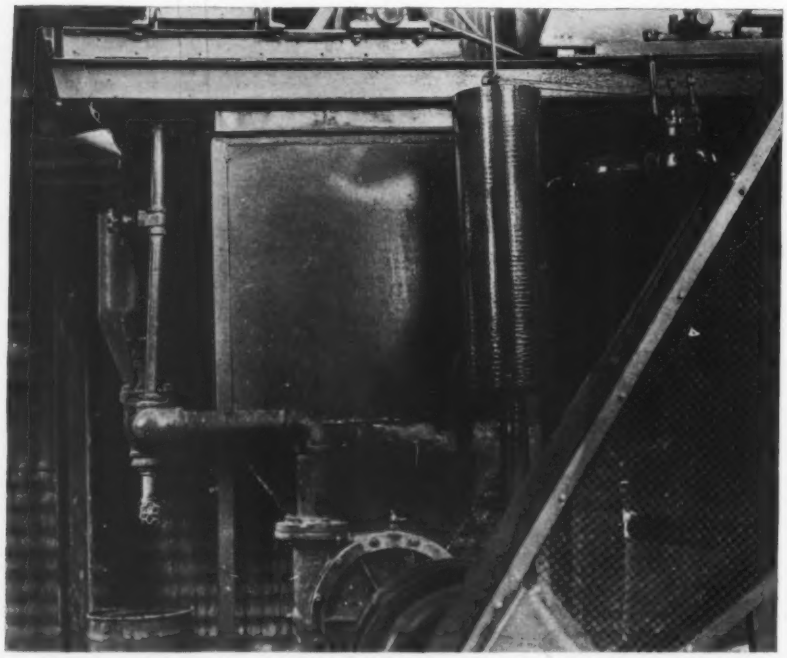
The gasoline as it comes from the agitators flows into the mixing chamber. At the bottom of this chamber, which is constructed similar to a hopper, there is a mechanical stir that thoroughly mixes the gasoline with the clay as it drops from the conveyor. On the same shaft with the mechanical stir is a centrifugal pump operated by an induction motor, which also, by the use of pulleys, operates the clay conveyor, thus giving a perfectly synchronized operation. From the centrifugal pump the gasoline goes up through a baffle plated mixer to the press.

Between the pump and the mixer there is a by-pass to the mixing chamber so as to circulate the gasoline in the mixing chamber when first starting up. When sufficient clay has been added at the start, the gasoline is allowed to flow up through the baffle plated mixer which increases the intimacy of contact and keeps the clay in suspension until it reaches the filter press. The plates in the press are covered with wool bags which retain the clay and allow the dry gasoline to flow up through and out of the press. At first the gasoline is allowed to flow back to the mixing chamber again until a slight cake is formed in the bags.

The gasoline is then treated with doctor solution, phenolphthalein and methyl orange for sweetness and neutrality respectively. The gasoline is then allowed to flow to the run down tanks.

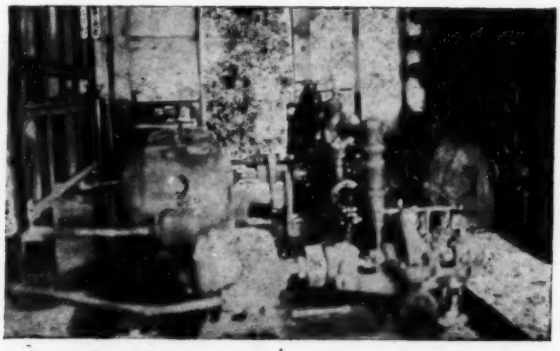
A 20-plate Sweetland press is used in this operation and at present the amount of clay used necessitates cleaning the press only after treating one thousand barrels of gasoline. It is possible with the present arrangement to treat with clay 1000 barrels in about seven hours.

The combined treating process has been in operation more than a year running every day without changing the wool bags. The run down tanks are free of water. The color of the gasoline has never been less than 30 +. Samples of the gasoline treated by this method have been subjected to light and air and have not changed in color or failed to pass the corrosion test.



MOTOR, PUMP, MIXING CHAMBER AND FLOAT CONTROL OF CONTACT CLAY FILTRATION EQUIPMENT AS INSTALLED AT THE VERNON, CALIFORNIA REFINERY OF THE MARINE OIL COMPANY

Exterior view of contact clay filtration process installed at Deepwater Oil Refineries, Houston.



Installation of four centrifugal, electric-driven pumps, which transfers the oil through the system.

Top of the mixing tanks showing working platform and open hatch through which the clay is dumped into the oil. The motors shown rotate mixing devices inside the tanks.

Use of Contact Clay in Filtering Lubricating Oils

By GEORGE REID
Staff Representative

USE of contact clay in the clarification of lubricating oils is gaining the interest of refiners. The so-called California clays, which terminology serves to differentiate the treated contact clays from Fullers earth, have for the past few years been the object of much investigation among refiners. Much work has been done which has resulted in a somewhat extensive application of the various clays to the problem of treating the lighter distillates, such as gasoline. The application and adaptation of contact clay treating to lubricating oils has been a little slower in its development, but the simplicity of the process, along with its speed, facility and accurately controlled results, have brought about a keen interest in the improved methods of clay treating now in operation at several refineries in the United States.

The Deepwater Oil Refineries, Inc., operating a 2500-barrel lubricating oil plant at Houston, has been also operating its contact clay lubricating treating plant since its completion seven or eight months ago. This plant was constructed after the design of J. P. Gillen, vice-president of the company and in charge of refinery operations, who perfected the system and process as installed at Houston.

Before entering into the discussion of this contact clay treating or filtration installation, it may be well to state that prior to subjecting the lubricating oil to clay clarification, this oil is in preceding stages of its manufacture, first subjected to vacuum distillation and other oils to the usual sulphuric acid and caustic chemical treatment in the agitators. After passing through these stages of its preparation the oils are then ready for the clay treatment, which at the Deepwater plant has supplanted the percolating process, which involves the use of Fullers earth and the ordinary cone bottom type of gravity filters.

Operating System

An illustration shows the exterior of the small building which houses the contact clay filtration plant. The entire assembly of equipment necessary for the handling of oils at the rate of 100 barrels hourly is housed under this one roof. The floor dimensions of the "lube house" are 60 feet by 90 feet. It is estimated that in this small area the filtration work done is about the equivalent to that which would require 15 percolators or filters of the ordinary size and type employed. Both unfinished and treated oils are stored in the steel tankage shown to the right of the sheet metal building.

Untreated oil after its preparation by vacuum distillation and chemical treatment, enters the contact clay plant through three and four-inch lines. Four Viking centrifugal pumps, driven by 20-horse power Wagner electric motors, are used to pump the oil into the plant, in circulating it through the heating units and to transfer it to the filter press and final storage. Fresh or untreated oil first enters five vertical, heavily insulated tanks, which are termed mixing tanks. These containers have a capacity of 50 barrels each, and after each tank is filled with oil, the contact clay is poured into the container through a hatch at the tank top. An accompanying illustration shows the arrangement of equipment for dumping in the clay and mixing clay and oil. Note that two of the hatches are open for purpose of illustration. The electric motors shown are employed to rotate the mixer, which is attached to the shaft inside of the oil tank. The photograph was taken on the top platform constructed parallel to the tops of the five heating or mixing tanks.

When the oil is charged and the clay

Filter Press separating the used clay from the oil. The finished product flows directly from this press to storage

deposited in the tank, then both clay and oil are circulated by one of the three centrifugal pumps previously mentioned, which picks the oil and clay mixture up at the tank bottom, to discharge it into heaters. The heaters are four in number and hooked up in series. They are constructed along the general lines of heat interchangers, the heating medium being live steam. As the oil and clay mixture is circulated through these heaters the temperature of the material is raised to the desired degree. This temperature is dependent upon the grade and type of lubricating oil undergoing treatment, and ranges from 290 to 320 degrees Fahrenheit as a rule. During the period in which the oil and clay are circulated, the rotor or mixer inside the tanks is also in motion, thus assuring intimate contact of the oil with the clay. When the desired temperature is reached, the circulating pump is stopped, and another of the centrifugal pumps immediately takes suction on the tank to pump the oil-clay mixture direct to the filter press, where the clay is removed and the oil passes on as finished product to temporary storage. When one of the mixing tanks full of oil is raised to proper temperature and ready for the press, then another of the five tanks is circulated through the heaters, and the operation repeated from one 50-barrel batch to another throughout the period of operation. The plant capacity under this arrangement is 100 barrels per hour. Contact clay is hoisted to the upper platform for use in the mixing tanks by means of an electric elevator. This device greatly lessens the work of the operator as well as tending to speed up the operation of the plant.

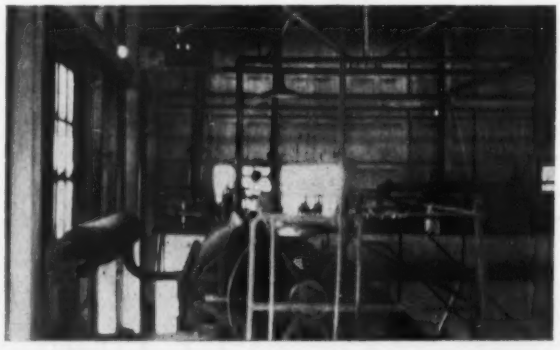
Clay Removal

A No. 10 Sweetland filter press is employed for filtering or clay removal purposes. Since only one press is included in the installation, it becomes necessary to shut down the clay removal operation occasionally to dump the used clay from the press. This operation requires but a few minutes to lower the bottom half of the press, rake out the clay and close it up again ready for further filtration work.

At the top of the filter press there is installed a score or more of gauge glasses, through which the filtered oil is constantly flowing. In this manner the color of the oil is constantly visible, and a number of pet cocks are provided, through which samples may be taken as often as necessary for color testing purposes. One of the advantages of the contact clay process lies in the fact that so long as the filter press is filling up with clay preparatory to its dumping and removal of the spent clay, the color secured by the operation is constant. This clarifying action is dependent upon the proportion of clay used per barrel of oil, which must be predetermined by experimentation. Thus it becomes difficult to state the exact volume of clay used per barrel of oil filtered or treated, for the many and various different grades of lubricating oils require different proportions of contact clay. This also holds true in the matter of heating the oil and clay mixture to certain predetermined and specified temperatures prior to filtration. The advantage, however, of constant color secured by the process is evident.

Another of the advantages of the contact clay process lies in its ease of operation, and in its speed. As was previously stated, the plan operators estimate that the one installation is performing the work of 15 percolating type of filters, and without the bother of repeated steaming and cleaning after each use.

Contact clay imported to Texas from California mounts in price to around $38 per ton, including the present freight rate on this material. The ease of operation, however, the speed secured and the accurate results obtained, which are reflected in the improved quality of the products manufactured, more than offset the seeming high cost of the clay used.



Filter Press and interior storage vats in the background, into which the finished clarified oil is delivered ready for marketing

Eastern Refining Plants Being Re-Conditioned

Pittsburgh, Pa.—A number of refining companies operating in the Appalachian or Eastern field are engaged in making certain changes and installing new equipment, bringing their plants up-to-date, etc., preparatory to the year's operation.

The Continental Refining Company, at Oil City, Pa., has about completed the installation of a new tube still and bubble tower fractionating device. They are also increasing the bright stock capacity.

Then Pennzoil Company is enlarging its No. 1 plant at Rouseville, just north of Oil City, Pa., to the extent of almost doubling its present capacity.

The Elk Refining Company at Falling Rock, W. Va., is constructing a wax plant which will soon be in operation.

The Conwango Refining Company at Warren, Pa., is making extensive improvements at its No. 1 plant for the purpose of increasing its production of bright stock.

The Empire Oil Works, Inc., at Reno, near Oil City, Pa., is constructing two buildings. One will house its enlarged filtering facilities, which are being doubled in capacity. The second house will be employed as a warm storage house for finished lubricating oils.

The Independent Refining Company, at Oil City, is also increasing its filtering capacity and installing a large bubble tower.

The Viking Oil Corporation, at Tidioute, Pa., has a tubular retort under construction.

The Crew-Levick Company has leased the Glade Oil Works to the United Refining Company, which latter organization is operating the plant.

The Tidioute Refining Company at Tidioute, Pa., is installing Sharples process for the manufacture of lubricating oils.

Both the Bradford Oil Refining Company and the McKean County Refining Company, in the Bradford area, have completed the installation of Sharples equipment for making lubricating oils and are operating the new equipment.

The Eastern Oil Refining Company plant, north of Warren, Pa., is being operated as a bright stock plant by the Warren Refining Company.

Color of Lubricating Oils In Acid Stage

By H. L. KAUFFMAN,
Consulting Petreloum Chemist

ONE of the essential steps in the manufacture of lubricating oils from asphalt or mixed base crudes is the treatment with sulphuric acid of the lubricating distillates obtained in the distillation of either type of crude or of the cylinder stock residuum left as a residual oil in the still after the distillation of a mixed base crude; occasionally, also, the residual oil (cylinder stock) from the distillation of a paraffin base crude.

Treatment of the oil with sulphuric acid followed by neutralization with a solution of either caustic soda or soda ash or, frequently, in the treatment of cylinder stocks, neutralization with ammonia, continues to be the general method used by refiners in the chemical purification of lubricating oils.

Purpose of Chemical Tretament

Crude oil is a mixture of different compounds or hydrocarbons in a pure state plus certain other compounds or complex hydrocarbons which, because of their characteristics and the fact that their presence in the finished product is detrimental thereto, may be classed as impurities.

The problem of the refiner therefore involves the separation of these products or compounds from each other and thereafter removing the impurities, by various refining methods, from the separated components of the crude.

Distillation, as a matter incidental to its chief accomplishment, partially segregates the objectionable asphaltic constituents into the heavier, or lubricating, distillates and residues. These impurities are finally removed by chemical treatment and filtration. In other words, the general purpose of treating lubricating oils with chemicals is so that certain impurities contained therein may be further removed. If the oil is not made free of these impurities, the commercial value of that oil is diminished.

Specifically these impurities, which are either already present in the crude or else are formed during the distillation process, are mostly organic bodies containing sulphur, oxygen or nitrogen. That is, they are asphaltic or bituminous substances that discolor the oil; and sulphur alcohols, pyridines and other organic substances that give the oil an objectionable odor.

By chemical treatment, then, a lubricating oil of lighter color, when examined both under transmitted and reflected light, is made; any free carbon or carbonaceous matter in the oil is removed; and a general purification of the product along the lines mentioned above results.

Briefly stated, the process of chemical treatment consists in mixing the acid (usually in several doses) with the oil by means of either air, gas (inert) or mechanical agitation. The acid reacts with the impurities in the oil to form a sludge, which settles and is drawn off from the bottom of the agitator. At this stage the acid oil is either neutralized by the so-called contact filtration process (which consists in neutralizing and decolorizing an oil simultaneously by mixing the oil either with a dry, finely-divided filtering clay or with a clay-pulp and thereafter removing the spent clay); or, the treated oil is pumped to a second agitator and therein neutralized with a solution of either caustic soda or soda ash. The chemical treatment of the oil is then completed by washing with water until all excess alkali and alkaline reaction products have been removed, after which the oil is pumped to a storage, or bleacher, tank. In the "bleacher", traces of moisture are removed and the oil is "brightened" by heating and blowing with air at the same time.

Factors Affecting Acid Treatment

The chemistry of the sulphuric acid treatment of lubricating oils is so complex and so little understood that one can scarcely do more than hazard a "guess" as to the reactions that take place. It is definitely known, however, that acid-sludge contains both true reaction products and mechanically entrained or absorbed substances that are "pulled-down" by the settling sludge.

The kind of acid treatment to be used depends entirely on the characteristics of the product being treated, the type of crude from which such product was obtained, and the degree of refinement desired.

The efficiency of the acid treatment depends upon four factors:

1. Temperature of treatment.
2. Method of mixing acid and oil.
3. Number of "dumps" and amount of acid used on each dump.
4. Length of time the acid and oil are in contact.

A general rule is to apply the acid to the oil when the latter is at the lowest temperature consistent with having the oil fluid enough to insure intimate contact between the acid and the oil.

Air agitation is the common practice in mixing the acid and oil. The use of air is objectionable due to its tendency to oxidize the oil, but nevertheless air is used generally because it is rapid, thorough and relatively cheap.

The number of acid dumps and the amount of acid used on each dump is determined by laboratory experiment; thus, it is learned how to vary the number of acid dosages and the amount of acid on each dose so as to obtain a maximum decolorizing efficiency from a given amount of acid.

The length of time the acid and oil should be in contact, in order to utilize the full value of the acid, depends upon:

1. Method and violence of the agitation.
2. Size and shape of the agitator.
3. Viscosity of the oil.
4. Quantity of acid used and number of dumps in which it is applied to the oil.

Strength of Acids

The grade of acid most generally used in the treatment of lubricating oils is 66 degrees Be. sulphuric acid containing 93 per cent acid. Acid of 98 per cent strength however, has been found by many refiners to be more efficient than 66 degree acid, particularly so in the treatment of asphalt base lubricating oils. Acid recovered from "acid-sludge", 60 degrees to 65 degrees Be'. gravity is frequently used on the first, or both first and second dumps, when treating some lubricating oils.

Types of Oil Given Acid Treatment

Because pure paraffin base crudes are relatively free from asphaltic constituents, few of the lubricating oils made therefrom require a treatment with sulphuric acid. Lubricating oils from mixed or asphalt base crudes, however, do require purification with acid.

Types of lubricating oils usually given an acid treatment are as follows:

1. Paraffin or wax distillate.
2. Non-viscous neutral or paraffin oils. (These are oils below 150/100 viscosity obtained from the distillation of pressed distillate, which is the wax distillate fraction made free of paraffin wax).
3. Viscous neutral or paraffin oils. (These are oils from 150 to 300/100 viscosity obtained from the distillation of pressed distillate).
4. Cylinder stocks. (Residual oils with a flash test of from 500 degrees to 600 degrees F.)
5. Long residuums. (Residual oils with a flash test of from 390 degrees to 500 degrees F.).
6. "Stripped" crudes. (Residual oil from which gasoline, kerosene and some gas oil have been removed).
7. Pale oils from asphalt base crudes.
8. Red oils from asphalt base crudes.
9. Slack wax and crude scale wax.

Treatment of Non-Viscous and Viscous Paraffin Oils

The following detailed description of the method of treating a non-viscous par-

affin oil is typical of the general practice in treating any lubricating oil with acid and alkali.

If the oil has any water in it after it has been pumped to the agitator, as indicated by a lack of transparency, such water must be removed before applying the main acid treat. The presence of water in the oil is detrimental to the efficiency of the acid treatment. This water is removed by a so-called "water-acid" dump; that is, by agitating the oil for from 5 to 10 minutes with from one half to one pound of acid per barrel of oil.

Sometimes it requires several small dumps of acid to remove all the water. A frequent practice is to apply small water-acid dumps until, after settling for from one to three hours, a small amount of sludge but no water is thrown down. Then it is absolutely certain that no water is in the oil.

The main acid treatment is applied to the oil in either one or two dumps, depending upon what previous experience has been as to the procedure by which most efficient results are obtained. From four to 16 lbs. of acid per barrel of oil is the total amount of acid generally used on oils of this class. When the acid is applied in two dumps, such dosages are usually equally divided.

After the oil has been agitated with the main acid dump for about 30 minutes, a sample is taken from the agitator, filtered, and examined for color. If the oil is not of the desired color more acid is added and the treatment is continued.

When the color of the oil is satisfactory, the "peppery" sludge is "knocked-down" by sprinkling the oil, continuing agitation, either with water or with a weak solution of caustic soda or soda ash. If the oil is one from which the sludge settles quickly, water is the best medium for "breaking it down."

In "breaking" any batch, add water or alkali solution in the smallest quantities necessary to get the minute particles of sludge to collect into lumps. A heavy oil containing a large amount of sludge may gather into lumps as large as a pea. Lighter oils contain less sludge and require more water to break them; furthermore, the lumps of sludge from such oils are often only the size of a pin-head.

"Breaking the batch", as described above, makes possible quicker and more complete removal from the agitator of the reaction products of the treatment.

While settling, the treater keeps drawing the sludge from the bottom of the agitator, as otherwise it is apt to solidify and clog up the bottom opening. The time of settling depends upon the judgment of the treater, and may vary from 2-3 hours to 12-14 hours.

When all sludge has settled from the oil, the oil is transferred to a second agitator and neutralized with a weak solution (1 to 5 degrees Be.) of caustic soda or soda ash. The lye solution is placed in the wash agitator prior to transferring the acid oil. After neutralization has been completed, as indicated both by the appearance of the batch and by the reaction of a sample to phenolthalein indicator, the batch is allowed to settle for from three to six hours. The excess lye and salts are now drawn off, after which the oil is washed with hot water (150-160 degrees F.) until freed of excess alkali. It is then allowed to settle and next pumped to bleachers where it is heated and blown bright.

Some refiners "soap" their oils during or following the chemical treatment. The addition of naphthenic soaps removes from the oil certain emulsifying constituents that are a product of the chemical treatment, and by this removal oils of better quality result.

Below are shown approximate temperatures for handling oils of various viscosities during the treating process:

Viscosity of Oil (Saybolt Viscosity at 100° F.)	Temperature of oils when Acid is added °F.	Temperature of Oil and Wash Water during Washing and Settling Period °F.
50	70- 80	110-120
75	80- 90	120-130
100	85- 95	130-140
150	90-100	140-150
200	95-105	150-160
300	100-110	155-165
500	105-115	160-170
1000	110-120	165-175
1500	110-120	165-175
2000	115-125	170-180

Treatment of Cylinder Stocks and Long Residuums

The same general principles are involved in treating cylinder stocks and long residuums as in the treatment of paraffin oils. The main differences are:

1. More acid is required—24 to 50 lbs. per barrel.
2. Higher temperatures are required for treating—130 to 170 degrees F., depending upon the viscosity of the oil.
3. Collection of the sludge by "breaking" with water is less often required.
4. Neutralization with ammonia (1½ to 4 oz. of 26° Be. ammonia per barrel of oil) in a second agitator, and no washing, since the addition of water would cause emulsification, is a common practice.

The contact filtering process, whereby oils are simultaneously neutralized and decolorized, is replacing in many plants the neutralization of cylinder stocks with ammonia.

Other practices include treating the oil in kerosene solution, which procedure makes possible subsequent neutralization with solutions of caustic soda or soda ash.

Having clearly in mind general refinery practice in the chemical treatment of lubricating oils, the discussion in the paragraphs following relative to the color of lubricating oils, after an acid treatment and before neutralization, will be more readily understood by the reader.

In treating an oil with sulphuric acid there is a general relationship between the quantity of acid used in treating the oil and the final color of the oil at the end of the chemical treatment, that is, after neutralization, if other factors affecting chemical treatment are maintained the same.

Many refiners market viscous and non-viscous neutral oils and cylinder stocks

(Continued on page 94)

TABLE I
Red and Pale Oils and Cylinder Stocks

Kind of Oil	Color Before Treating	Amount of Acid Used (lbs.)	Color of "Acid Stage" Sample	NPA	Color of Finished Oil Lov.
30 Pale	20—½"	4	2½"	2½	..
30 "	45—1"	10	Plus 10¾"	..	15—1"
30 "	Plus 2½ NPA	4	1—½"	..	..
28 "	3½ :4NPA	..	10—½"	2½ :3	..
28 "	3½ :4NPA	5	8—½"	..	10½"
28 "	4 :4½ NPA	5	10—½"	2½	..
28 "	35—¼"	5	5—¼"; 10—½"	..	..
28 "	40—¼"	6	35—1"	..	20—½"
25 "	75—¼"	6	30—½"	..	55—½"
25 "	60—¼"	9	20—½"	..	20—½"
25 "	60—¼"	9	20—½"	3	30—½"
25 "	55—¼"	6	15—¼"	3½	..
25 "	4½ :5 NPA	..	2½ NPA	2½	..
25 "	40—¼"	9	2:2½ NPA	2½ :3	..
25 "	....	8	140—½"	3½ :4	..
Cylinder Stock	2000—10%	25	180—10%	..	180—10%
" "	800—10%	28	110—10%	..	145—10%
" "	700—10%	26¼	60—10%	..	120—10%
" "	520—10%	30	95—10%	..	120—10%
" "	330—10%	15	80—10%	..	80—10%
" "	300—10%	29	75—10%	..	85—10%
" "	300—10%	28	65—10%	..	80—10%
" "	300—10%	29	75—10%	..	85—10%
" "	300—10%	29	85—10%	..	..
" "	275—10%	30	50—10%	..	60—10%
250 Red Oil	320—¼"	10	30—¼"	4½ :5	40—¼"
250 " "	300—¼"	..	55—¼"	4 :4½	..
250 " "	300—¼"	9	60—½"	4½	..
250 " "	250—¼"	12	25—¼"	4	30—¼"
250 " "	230—¼"	10	25—¼"	4 :4½	..
250 " "	230—¼"	..	65—½"	..	..
250 " "	210—¼"	12	20—¼" :40—¼"	..	30—¼"
250 " "	200—¼"	..	35—¼"	..	35—¼"
250 " "	200—¼"	8	35—¼"; 65—½"	..	40—¼"
250 " "	200—¼"	9	40—¼"	..	50—¼"
250 " "	200—¼"	11	25—¼"	..	35—¼"
250 " "	200—¼"	8	30—¼"	..	40—¼"
250 " "	200—¼"	9	25—¼"	Plus 5	..
250 " "	200—¼"	9	75—½"	Minus 5	..
250 " "	190—¼"	10	25—¼"	4½ :5	..
250 " "	190—¼"	10	25—¼"	..	..
250 " "	185—¼"	9	20—¼"; 40—½"	4 :4½	..
250 " "	185—¼"	10	60—½"	4 :4½	..
250 " "	180—¼"	10	50—½"	4	..
250 " "	180—¼"	9	30—¼"; 60—½"	..	40—¼"
250 " "	180—¼"	9	55—½"	Plus 4½	..
250 " "	180—¼"	7	25—¼"; 50—½"	..	80—¼"
250 " "	180—¼"	10	35—¼"	Plus 4½	..
250 " "	180—¼"	9	25—¼"; 50—½"	..	30—¼"
250 " "	170—¼"	8	30¼"; 60—½"	..	40—¼"
250 " "	160—¼"	10	30—¼"	..	40—¼"
250 " "	130—¼"	8	25—¼"; 45—½"	4	..
300 " "	300—¼"	12	35—¼"; 135—1"	4½	..

Tube Stills Exact High Yield In Skimming Practice

By GEORGE REID
Staff Representative

DISTILLATION of crude petroleum at the Pure Oil Company's Smith's Bluff Refinery is confined entirely to tube still practice. With a total capacity of 20,000 barrels daily for crude oil, no shell stills are used in the skimming procedure. While similar practice has become more or less extensively employed among refiners in the last two or three years, it will be recalled that at the time of construction of this plant, early in 1924, skimming crude oil and subsequent fractionation of the desired products in one operation was a departure from customary practice. During the three years of operation since this refinery was first placed on the lists of operating installations, the original distillation equipment has been in practically continuous service, and this somewhat early adoption of tube still and dephlegmator type of plant has no doubt been a contributing factor to the growth and development of this general type of efficient refining plant.

The plant is located on a 600-acre tract about eight miles from Beaumont, Texas, on the Neches River. This latter provides a channel 30 feet in depth, and upon its banks, adjacent to the refinery proper, is located the company's shipping terminal. Crude oil is supplied the plant by pipe line from Mexia and Nigger Creek, 236 miles away.

With the exception of the usual repairs concurrent with plant operation, and the installation of a fourth tube still, where originally there were but three, there have been little changes in construction, design and layout since the plant was completed. The fractionating equipment on the Foster tube stills has been changed throughout, the original smaller dephlegmators being replaced with larger equipment improved in design and more simple in operation. The present towers are about 80 feet in height. Two of such towers are installed for each tubular retort. Briefly the plant consists of the essential equipment necessary for a central steam power plant, four tube stills and their fractionating dephlegmator equipment, nine shell in series, 26 Cross cracking units, the continuous treating installation working in conjunction with five 1000-barrel agitators, a water and an oil pump house and a gasoline recovery plant. In addition to this there is the terminal and unloading equipment, Mantius acid recovery plant, warehouses, office buildings and laboratory. It is not within the scope of this writing to describe in detail all of this installed equipment, its construction and the manner in which the refinery is served by each separate department. At this time only the distillation equipment for skimming, cracking and rerunning of pressure products will be dealt with, leaving other important and interesting features for future discussion.

Distillation of Crude Oil

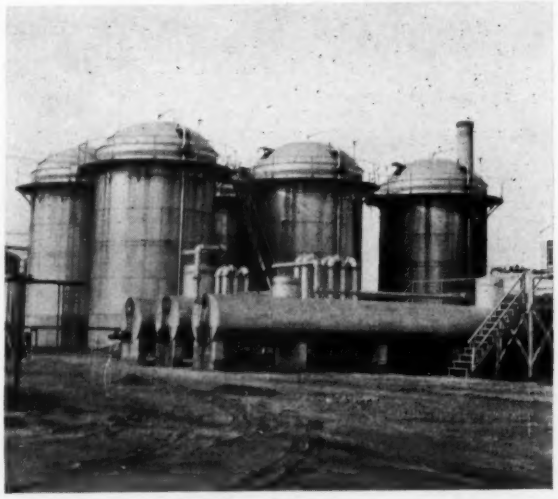
All of the crude oil is charged to the tube stills and with one application of heat 85 per cent of this charging stock is taken overhead and fractionated into the desired products. The plant charges either Mexia crude, Nigger Creek or a mixture of the two. It has been definitely proven that the equipment, though primarily designed for operation on crude of heavy type, such as Mexia, handles lighter oils with equal facility and efficiency.

Crude is charged to the retorts by Gould's triplex pumps, size eight by 14 inches. These pumps are capable of charging 5000 barrels each daily at a pressure of 125 pounds. The triplex pumps are electric motor driven, using General Electric 50-horse power variable speed motors. The speed of the pumping operation is controlled by the variable feature of the peculiar motor employed. Foxboro orifice meters are installed on each of the three crude oil charging lines leading from the pumps to the stills, and thus accurate measurement of the daily through-put is secured.

Before the crude enters the Foster retorts, it is preheated in the usual manner in interchangers, or preheaters. The crude is charged to the top of the towers where the mechanical arrangement of this equipment carries the crude oil in closed system counter current to the rising hot vapors from the stills, and at the same time employs the cool crude oil at a "knock back" medium essential to proper control of the tower temperature.

Leaving the preheater sections, the crude is conducted into the tubular retort. These are Foster four-inch stills with two sets of coils inserted in parallel in each still. There is about 10,000 feet of travel per still and through these coils the oil is raised in temperature from around 300 degrees F. to 800 or 850 degrees F. This temperature is naturally governed by the type of oil charged and the vaporization required. Usual practice is to vaporize about 85 per cent with the resultant residium running around 14 to 15 degrees A. P. I. gravity. The installation of four tube stills of this type is shown in an illustration.

The heated crude leaving the tube stills is then conducted to the separators or vaporizers, located between the stills and the fractionating equipment. In the vaporizing device the residuum is drawn off by pump from the bottom, where the level of this residue is controlled by automatic liquid level controlling devices. The vaporized portion of the oil is conducted from the top of the separator through the vapor lines into the bottom of the first 80 "foot" tower.



AGITATOR ASSEMBLY AND HORIZONTAL CONTINUOUS SWEETENERS. STRAIGHT RUN AND CRACKED GASOLINE ARE TREATED TOGETHER WITH "DOCTOR" SOLUTION TO THE DESIRED SPECIFICATIONS.

Four Cuts From Tube Stills

The towers are equipped with temperature control devices, control sections through which the incoming cool crude passes, as previously described, and at the bottom the level of the accumulating reflux material is controlled by positive acting level controlling instruments.

Each tube still unit is the source of four separate

streams of cuts. When the crude oil is subjected to preheating prior to its exposure to the heat generated in the tube still furnace, this first preheating prior to its exposure to the heat generated in the tube still furnace, this first preheating imparts sufficient temperature to the oil to drive off a small amount of gasoline vapors. These vapors are removed in an evaporator before the crude enters the still. The vapors leaving the still and entering the first tower are there fractionated and reduced in temperature sufficiently to cause the condensation of all of the heavy gas oil or heavy Cross cracking stock. This cracking stock is taken off of the bottom of the first tower. The remaining vapors pass upward through the tower and are conducted from its top into the bottom of the second tower. Here the fractionating and condensation is carried further, and from the bottom of this second tower is removed the kerosene cut. This is also a reflux accumulation and its removal is continuous from the bottom section of the tower, where its volume and level is likewise controlled by liquid level control instruments. This product is also called light cracking stock, for when kerosene is not desired for shipment, the product is charged for the Cross units for partial conversion into gasoline.

The kerosene derived from the bottom of this second dephlegmator is a closely fractionated cut with an initial boiling point close to 400 degrees Fahrenheit and end point around 550 degrees Fahrenheit. The material is derived direct with a color of about 23 Saybolt, and it is, therefore, not difficult to treat it to permanent color specifications of 25 plus or better.

Gasoline Yield

The gasoline yield is taken overhead from the second tower; water white and U. S. motor specifications, with the exception of initial boiling point, which is hardly to be expected from the type of crude oils charged. Judicious blending corrects the high initial. The end point of the gasoline is within U. S. motor requirements, and the color is well above 25 Saybolt. The towers are subjected to such close, accurate control that continuous fractionation according to the desired specifications is not at all difficult to attain.

Condensation and cooling is secured through steel boxes, in which Sterling cast iron sections are immersed in constantly moving water. All of the streams are taken through the receiving house through a closed system. Vapors and gases resultant from the distillation procedure are here removed by vacuum gathering lines and conducted to the gasoline recovery plant where they are compressed and the valuable components removed as gasoline.

With four of these tube still units in stimultaneous operation it is possible to charge about 20,000 barrels of crude daily and in one heating to fractionate the resultant vapors into gasoline, kerosene and gas oil, along with the preparation of the 14 to 15 gravity fuel oil residuum. It is impractical to state definitely the percentages of the various commodities produced at the refinery because of the fact that these percentages are directly governed by market requirements. Gasoline recovery is controlled by the amount or volume of kerosene shipped, for these shipments detract from the ultimate percentage of gasoline recoverable from the total yield of kerosene. Likewise, fuel oil specifications may at times require a lighter or heavier product, and gasoline itself is subject to change in its gravity and other specifications. An average yield of gasoline for this plant may be stated as 60 to 65 per cent of the crude charged, though at times this percentage has run 70 to 75 per cent.

Cracking Process

The 26 Cross cracking units are charged with the gas oil or heavy cracking stock, and kerosene, or light cracking stock, derived from the crude skimming operation. This material is usually charged to the cracking units as a mixture of gas oil and kerosene, though the proportion of kerosene in this stock is here again governed by the amount of kerosene shipped from the plant. The cracking coils are operated at the usual temperatures and pressures employed with this type of unit—600 to 700 pounds pressure and around 800 to 850 degrees Fahrenheit temperature. The finished pressure distillate is conducted from the condenser boxes to to one centralized receiving house where all of the distillate is handled through one manifold and directed into one tank. The centralization of receiving house effects a saving in labor necessary to operate the cracking coils, and it is far enough removed from the scene of activity and high pressure to eliminate a great deal of the hazard in the event of flashes or fires on the separate coils.

The pressure distillate run to storage from the 26 coils is tranferred to the treating department. Here it is treated with sulphuric acid, neutralized with caustic and sweetened. The treating assembly consisting of five 1000-barrel agitators and the continuous horizontal sweetener is shown in an illustration. In this equipment the pressure distillate is prepared for redistillation, the kerosene is treated to color and doctor sweetness, and the gasoline is sweetened continuously. At this refinery it has been found that the gasoline derived from pressure units need not be treated separately, but that this material is easier to treat to corrosion, sun test and doctor sweet when it is in solution with the straight run gasoline derived from the tube still operation.

After chemical treatment the pressure distillate is removed to storage from where it is charged to the series on nine shell stills. The first five stills in this battery are equipped with dephlegmators of the well-known harp type, about eight feet in height and fabricated by welding vertical sections of inch and a half pipe to horizontal headers of four-inch pipe at each end. On the last four stills in the series are installed fractionators evolved by the engineering staff of the Pure Oil Company. The details of operation and mechanical construction of these towers are not given out by the company, but they are considered efficient in that the initial boiling point of the residuum leaving the final still in the series checks within a few degrees of the end point of the distillate taken overhead from the last still.

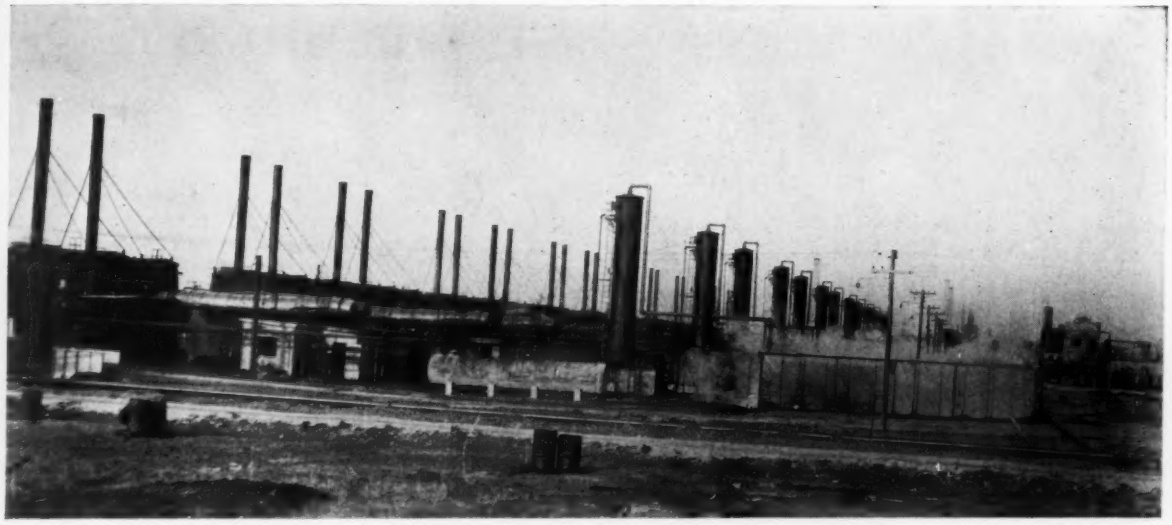
The pressure distillate is charged to the stills by a National Transit 10 by 12 steam pump. The charging stock is conducted to the top of the dephlegmators on the last five stills where it acts as a cooling agent or "knock back" in a closed system and where sufficient heat is absorbed by it to effect the removal of a light stream of gasoline. After this preheating of pressure distillate are released is directed in its flow into a large separator or evaporator installed above the level of the condenser boxes. In this device the vapors resulting from the preheating of pressurt distillate are released and conducted through the vapor line to a condenser box. The condensed stream of gasoline, called the preheater stream is about 75 degrees A. P. I. gravity. The preheated charging stock then flows from the bottom of the vaporizer by gravity into the first shell still and thus through the series of nine stills. Including the nine separate streams taken overhead from the battery of shell stills, the preheater stream, and the residuum, the shell still battery yields 11 fractions. The overhead streams from the continuous battery of stills gradually decrease in gravity from around 75 degrees A. P. I. until the final, or ninth stream removed from the last still in the series, weighs 40 to 41 degrees A. P. I. and this final stream of such low gravity has an end point ranging from 430 to 435 degrees Fahrenheit. The fractionation in this series of stills where small cuts are removed and the operation is not unduly fast is responsible in some measure for the high yields of gasoline prevalent with this plant's operation. All of the gasoline is removed from the pressure distillate in this operation. The initial boiling point of the still bottoms or residue from the last still checks closely with the end point of the last stream removed. It is possible with the present equipment to make a negative gap at this point according to operators at the plant, but this is not customary practice.

After the gasoline has been removed from the pressure distillate the remaining oil or residue from the stills is returned to the Cross units for further cracking.

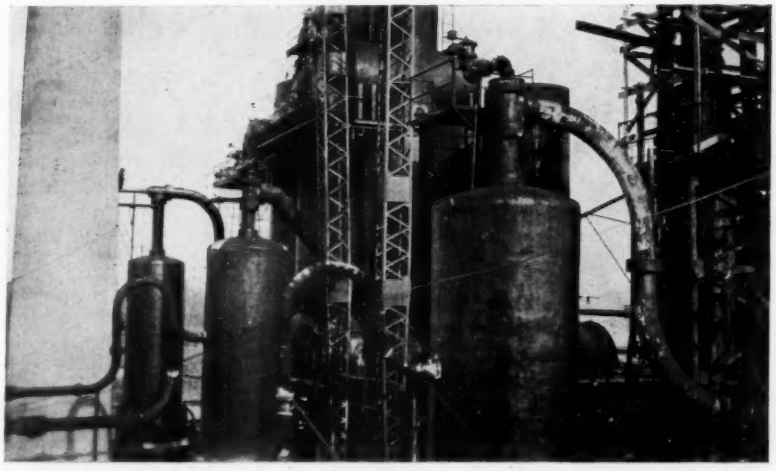
All 10 of the overhead streams derived from this redistillation of pressure distillate are combined in one flow line and directed into one tank. This same tank is also receiving storage for the straight run gasoline distilled from the crude oil charged to the tubular retorts. This mixture of straight run gasoline and pressure gasoline is then treated together in the continuous treating equipment as shown in an accompanying illustration. All that is required to chemically treat this gasoline to "doctor sweet" corrosion test is the usual sodium plumbite or doctor solution.

Russell Vernor is refinery superintendent for the company at the Smith's Bluff plant.

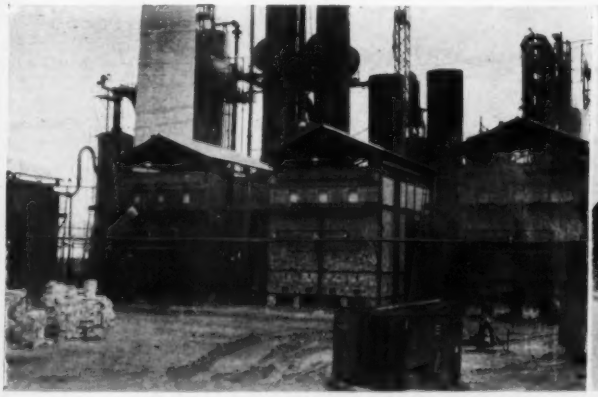
Views of Cracking Equipment—Pure Oil Refinery at Smiths Bluff



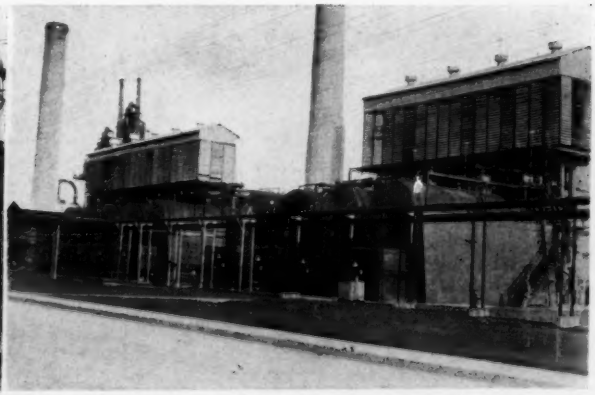
INSTALLATION OF 26 CROSS CRACKING UNITS IN OPERATION.



FRACTIONATING EQUIPMENT AND VAPORIZERS, NEW EQUIPMENT RECENTLY INSTALLED.



VIEW OF FOUR FOSTER TUBE STILLS.



BATTERY OF NINE SHELL STILLS USED FOR REDISTILLATION OF PRESSURE DISTILLATE

Elimination of Wild Fractions by Recycling In Manufacture

By ALEXANDER B. MORRIS,

THE spur of keen competition has driven natural gasoline manufacturers to devise many ingenious schemes for increasing net income. Some of these have taken the direction of increasing the volume of plant output, and some have looked to reducing plant operating costs. A few have had as their object the increasing of the sales value of the product, sometimes at the expense of volume.

The idea of reducing weathering losses by recycling the wilder portions of the gas originally absorbed by the oil was first applied in the stabilizers, which acted upon the gasoline after it had been otherwise completed and made ready for weathering. Definite temperature brackets are established in the stabilizers, outside of which nothing will get into the final make, and within which everything that is recovered can be retained at ordinary atmospheric temperatures. The use of such stabilizers has frequently cut the difference between gross and net production from 25 per cent of gross to 10 per cent; but their use involves the payment of royalties felt by many to be objectionable.

It was lately discovered that recycling to eliminate wild fractions need not be confined to an after treatment, but can be applied at other stages in the process of manufacture. Two recent designs of this nature are described in the following. In figure I is shown a plant hook-up for accomplishing this purpose which requires as additional equipment only a secondary absorber; and where there is already such an absorber in use on tail gas, no other equipment is necessary.

Operating Process

The operation is as follows: the fat oil is discharged from the main absorber into a vent tank so arranged as to present a large exposed oil surface, and the pressure is dropped to about five pounds. The vapors thus vented are conducted directly to the secondary absorber through which a small part of the cold lean oil is circulated; the enriched oil from this absorber discharging into the same vent tank. The fat oil is then conveyed by means of the customary pumps through the heat exchanger, preheater, and evaporator to the lean oil tank, where it is picked up by the lean oil pumps and started through the system again. The pressure drop in the vent tank, and the extended oil surface permits most of the wild fractions to leave the oil. Some of the heavier desirable fractions also pass off, but these are promptly caught in the fresh oil in the secondary absorber.

The efficiency of this absorber is low on account of the low pressure at which it is operated, but the quantity of oil and vapors passing through it are relatively so small that this loss is scarcely perceptible, and it is far outweighed by the advantage of obtaining a refractionated product. Due to the greater solubility in oil of the heavier fractions of the vapors passing off the vent tank, these are practically all recovered, whereas the wild, undesirable portions, requiring high pressure to effect their complete absorption, are practically all lost to residue. The wild gasses leaving the secondary absorber therefore are only those which cannot be held captive at the temperature and pressure condition of the system, and are the fractions which, occurring in the final make, cause excessive weathering losses. There are only two points in this system where control need be applied to affect the quality of plant make. One is the vent tank, where pressure may be regulated, and the other is the vapor cooler, where temperature is the element of control.

Two Grades Simultaneously

In Figure 2 is shown a hook-up whereby not only can weathering losses be reduced or practically eliminated, but as a result, two grades of product can be produced simultaneously from the same equipment. This requires the use, either of very carefully synchronized lean and fat oil pumps, or,—and preferably—, of a heat exchanger designed to operate at low head, so that the fat oil from the absorber will gravity through it. Excellent heat exchangers of this type are now available.

The fat oil from the absorber passes through the heat exchanger before discharging into a vent tank, as is the usual procedure. The fat oil is therefore hot when it reaches the vent tank, say about 210 degrees F., and the pressure on the vent tank is reduced to about 20 pounds.

The vapors released at this pressure from the hot fat oil contain practically all the wild fractions and but a small part of the heavy fractions. These vapors are passed directly to a vapor condenser, and the condensate is accumulated as high gravity, low recovery Grade C make. The tail vapors from the condenser may pass directly to residue, or be recompressed. The hot fat oil is cooled in the vent tank, in the process of releasing these vapors from the 210 degrees F., at which it entered, to about 165 degrees F., and at this temperature it is picked up by the fat oil pumps and passed through the preheater where it is raised to about 400 degrees F. and to the evaporator, which it leaves at about 325 degrees F. It is then picked up by the lean oil pumps and recirculated through the heat exchanger, oil cooler and absorber. The pressure in the evaporator and the dephlegmator is maintained at 20 pounds and the temperature in the latter at about 200 degrees F. The vapors from the dephlegmator are then condensed in a separate condenser and accumulated as the low gravity, high recovery Grade A make.

It will be noticed that the wild fractions are removed from the A make early in the process and are treated and collected separately. Due to their removal from the oil before its final heating, less still and dephlegmator capacity are required, and there is less temperature drop in the evaporator, tending to give a more complete purging of the oil while passing through it, and thus contributing to high efficiency of the absorbers.

Heat Saving

The temperature drop which is thus saved at a point in the process where it is harmful, actually takes place in the vent tank at the outlet end of the heat exchanger where it is made to serve the useful purpose of separating out the wild fractions. The removal of these gasses from the oil before it reaches the preheater increases its efficiency.

The ideas embodied in these two hookups can be combined, though the writer does not know that this has been done. He is informed that both systems yield tail vapors so lean in condensable content as to make the operation of a recompressor unprofitable. In a combination hoop-up the condenser temperatures would be held a trifle higher, or the pressures reduced, so as to yield a slightly greater volume of tail vapors. The tail vapors from both condensers would then be lead to the secondary absorber, through which a small part of the cold lean oil would be circulated; this oil, when enriched, to be drawn into the line to the heat exchanger from the main absorber. This arrangement would combine the advantages of recycling with those incident to their segregation before reaching the distillation or condensation phase, and should result in a more complete separation than is attained by the use of either alone.

Pennzoil Installs Dubbs Unit

Oil City, Pa.—The Pennzoil Company is now installing two 1000-barrel Dubbs Cracking Units at its refinery here.

Pennzoil is a subsidiary of the South Penn Oil Company.

Walworth

Class "A A" Valves

Sigma Steel Body *Sigmalloy 351 Trim*

Careful tests in oil cracking service have proved the imperative need of superior trim material for high-pressure, high temperature valves. Hence, Sigmalloy No. 351 trim for this new Class AA Walworth Sigma Steel Gate Valve. Sigmalloy No. 351 is used for the seat and disc rings, stem, bonnet bushing, packing gland and stuffing box bushing. The yoke nut is rolled steel. Flanges faced for any type of joint.

Now available in Series 150 to 1350 Walworth Sigma Steel Wedge Gate Valves.

Under actual operating conditions our Class AA valves, Sigmalloy No. 351 trim, have demonstrated unprecedented resistance to corrosion at excessive temperatures. Sigmalloy is the name registered in the United States by Walworth for valve trim and other material of special character with superior qualities of heat and corrosion resistance not possessed by ordinary valves and fittings. Its presence indicates superior qualities of strength and resistance to heat and corrosion.

For full details of our new Class AA Walworth Sigma Steel Valves, send for a copy of Bulletin No. 12-C.

Especially Designed For OIL CRACKING SERVICE

WALWORTH

WALWORTH CO., *General Sales Offices:* 51 East 42nd St., New York

Distributors in Principal Cities of the World

THIS IS THE MARK OF WZ *WALWORTH SIGMA STEEL*

TRADEMARK REGISTERED

Mention Where You Saw the Advertisement

Thermodynamics of Some Refinery Problems

By J. T. HAYWARD,
Member Institution of Petroleum Technologists, London

Taken from a discussion presented before the Ploesti Branch

POWER is required in a refinery to work the various pumps, and supply light, etc. At the same time considerable quantities of process steam must be furnished, though this requirement will probably become less as improved methods are introduced.

Suppose that water is required in a town on the plain, and that it is supplied by a water company who have run a pipe line up to a high level spring in the neighboring mountains. A pressure of only a few metres being required in the town, the water people throttle the high pressure down in a reducing valve before it enters the town mains. A demand for power springs up, so that the enterprising water company replace the reducing valve by a water turbine, and as they continue to demand the old rate for the low pressure water supplied to the town; but which now passes through the turbine, they are able to generate power practically for nothing, and to sell it to the complacent townsfolk at a handsome profit.

In a refinery the generation of power may, in a similar manner, be combined with the supply of process steam, back-pressure or pass-out engines being used for the purpose. The water analogy when extended to heat, is not perfect, because although no water is actually lost in passing through a turbine, some of the heat disappears in a heat engine when doing work, and the latter does not therefore behave exactly as a reducing valve, although for practical purposes the difference is not so very great. It is a very efficient power plant that can develop a H.P. hour on less than 3000 Calories; but a pass-out or back-pressure engine, when credited with the heat handed on in the process steam, may give a H.P. hour for around 1000 Calories, the fuel cost of power generated in this manner therefore being only one-third of that of the regular power station.

Even the ordinary direct acting pump or the simple steam engine, when run as a back-pressure machine, may approach these figures, as though the gross steam consumption may be high, the net figure will vary very little with the size and type of engine.

Fuel charges comprise around 50% of the total cost of refining, giving the word its meaning here, namely skimming off 50% to 60% together with the consequent treatment of the products. Fuel economies are therefore of great importance. Heat exchange, equipment, etc., of course, costs money; but as the amount of fuel fed to a battery of stills in the course of a year will exceed the value of the battery and all its attendant equipment, large additions to the first cost designed to effect even small fuel savings will be justified.

The sum of the latent heats of the distillation products, not being substantially greater than that of the original crude, it follows that a thermally perfect refinery, once started, would require no fuel and incidentally no condensing water. In other words, all the heat used in actual refining is wasted in the various losses.

Returning to water analogies. Assume that we have some piece of apparatus that requires a constant flow of water through it. We may construct a suitable trough from the supply to the apparatus, and let the water run through. Suppose again that this piece of apparatus requires 10 gallons of water per minute, then 10 gallons per minute will have to be taken from the supply, to run it. At first sight this might appear to be the best that could be done; but suppose we catch the water as it comes out, and cause it to run a second piece of apparatus placed below the first. In this manner, though only 10 gallons per minute be taken from the supply, two pieces of apparatus, each requiring 10 gallons per minute, can be run. The process might be continued by placing a third apparatus below the second, a fourth below it, and so on; but in practice, the extent to which this can be done will be limited as follows: Small leaks will constantly reduce the stream; thus, while 10 gallons per minute flows to the first stage, only 8 may be be available for the second, and 5.43 for the third, and so on. Even so, the combined throughput of the several apparatus, will exceed the quantity taken from the source. A second limitation to the process, is that in order to get the water to flow, each piece of apparatus must be placed lower than the preceding one, and this will place a limit to the number that can be inserted in any given fall. In order, therefore, to make the maximum use out of the supply, we must reduce leaks to a minimum and endeavor to lose as little head as possible, arranging the fall so that it is only just sufficient to cause the necessary flow.

Fractional distillation and condensation are processes widely used in industries other than oil; in the manufacture of sugar, and of the alcohols, for example. The simplest plant consists of a still, fire or steam heated, and connected by a vapor pipe to a condenser. Considering such a plant, and supposing it to be perfect and there to be no loss of heat, either by radiation or otherwise. If running batch, for every 100 Calories fed to the still, distillation equivalent to 100 Calories would be done. Eventually all the heat fed in would appear in the vapor and after being used once over, so to speak, be rejected to the condenser. If the still was run continuously, some of the heat would appear in the wash liquor or residue; but assuming perfect liquid to liquid heat enchangers, the whole of the heat put in would again appear in the vapor, and distillation representing 100 Calories be done, for every 100 Calories put in. At first sight it might appear that such figures were ideal, and could not be attained in practice; but about 100 years ago the so-called multiple effect evaporator was invented. In a manner similar to that in which a supply of water of 10 gallons per minute could, as already shown, be made to run several apparatus each requiring 10 gallons per minute by placing them in series, so 100 Calories of heat can be made to cause evaporation representing 300 and 400 Calories. The vapors from a still are passed through the coils of a second still, those from the second through a third, and so on. In actual practice there are losses by radiation, etc., and the number of times that the heat can be used over again is limited by the fall in temperature from stage to stage; but sextuple effect evaporators are in successful operation and their working efficiency may reach 4.5 times that of a perfect simple still, that is to say, for every 100 Calories fed in, distillation equivalent to 450 Calories is done.

How nearly are such efficiencies approached in oil refineries? Does 100 Calories in fuel ever do more than 100 Calories worth of distillation? In stills fitted with the usual vapor heat exchangers we have something corresponding to a double effect evaporator; but is the exchange ever anything like complete, and are the vapors from the exchangers ever taken in their turn to further exchangers?

If the ratio of 4.5 mentioned above as

(Continued on page 110)

This cracking still, 8 feet inside diameter, 3½ inch sidewalls, 65 feet long, weighing 268,600 pounds, operates at 450 pounds pressure at a temperature of 900 degrees.

Helping To Revolutionize The Use Of Cracking Stills

Just as cracking revolutionized the refining of crude oil, Smithsteel Cracking Stills have revolutionized cracking. They have swept away the old limitations on the size of units.

The A. O. Smith Corporation has built the world's largest cracking still. The walls are 3½ inches thick, the inside diameter 8 ft., the length 65 ft., and the weight 268,600 lbs.

This cracking still, however, does not indicate the largest size to which Smithsteel Cracking Stills can be made. Smithsteel Cracking Stills can be built to any desired size, within transportation limits.

The A. O. Smith Corporation will gladly place complete information before you.

A. O. SMITH CORPORATION, *Milwaukee, Wisconsin*

Mention Where You Saw the Advertisement

Gasoline Plant Operators Hold Two Texas Meetings

Association of Natural Gasoline Manufacturers begins season of field technical conferences

THE Association of Natural Gasoline Manufacturers held two very interesting meetings of plant operators in March. The first meeting was held at Ranger, Texas, on Tuesday, March 22, and at this time there were 153 operating men registered, attending both the afternoon and the night session. At Wichita Falls, Texas, March 25, the second meeting was attended by 73 operators, according to the registrations. As usual, however, a number of men failed to register, and the total attendance at both meetings was indicative of much interest in the plan. All of the plants in both districts were represented, and there was a definite proposal to continue the policy of periodic operators' sessions during the latter part of this year. With the annual convention of the Association of Natural Gasoline Manufacturers to be held in Tulsa, May 23, 24, 25, it is not planned to hold another series of operators' meetings until some weeks after that time.

The first meeting at Ranger was presided over by Dr. E. R. Lederer, vice president of the Texas Pacific Coal and Oil Company, Fort Worth. Among the excellent papers read at this meeting was that of D. A. Sillers, superintendent of the gas measurement department for the Lone Star Gas Company of Dallas. The presentation of this paper opened the meeting. Gas Measurement was its title, and its reading elicited some very interesting interchange of ideas on the subject of the relative value of flow charts and numerous other items of equipment employed in gas measurement.

C. A. Edwards, superintendent of the Ranger district for the Chestnut & Smith Corporation, presented a paper, "Plant Operation." He discussed the travel of gas through the plant, condensing and cooling coils, oil pump operation, oil rate requirements for gasoline extraction, continuous testing of residue gases, and safeguards against the discolorization of the finished product. Discussion following this paper was brisk, and many of the unsolved problems of the plant operator were brought into the interchange of opinion. They talked freely of such subjects as the chemical treatment of gas and gasoline containing hydrogen sulphide such as occurs in the West Texas and Panhandle fields. This gas is destructive to many metal parts about the plant, especially brass and copper, and the problem presents itself as to how the gas may be treated before it enters the compressors. Other subjects of importance were brought into the discussion, which indicates that this branch of the petroleum industry is also no longer fraught with the old-fashioned idea of secrecy among the individuals engaged in it.

Absorption Oils

Dr. Lederer introduced the subject of the advantages of the preparation of absorption oils for absorption plants from the same crude production, or field, from which the natural gas treated was recovered. He stated that it had been definitely proven by experiments conducted in his company's laboratories, that better efficiency is secured in an obsorber when the absorption medium is derived from the same type of crude as the natural gas. It seems that the same type of general characteristics of both oil and gas are beneficial to the efficiency of the gasoline plant.

The concluding talk for the afternoon session was given by Don J. Wallace, safety director of the Mid-Continent Oil and Gas Association. Under the title of "Good Housekeeping," Mr. Wallace pointed out the advantages to plant operators of keeping their plants in the very best condition as to cleanliness. All plant superintendents were advised of the advantages of arranging training classes in safety work, which is taught free by the Bureau of Mines. A. V. Bourque, secretary of the Association of Natural Gasoline Manufacturers, was used as the injured employe in Mr. Wallace's demonstration of the prone pressure method of resuscitation.

At the night session at Ranger, which was equally as well attended as the first program, A. V. Bourque started the meeting with a talk on co-operation between the plant and the office. He stated that each department should try and realize the problems and difficulties faced by the other, and that both should keep in mind the good of the organization as a whole. Mr. Bourque's remarks were of much interest to the plant operators.

The general subject of "Water Treatment" was ably discussed by Otto Peters, superintendent of the Hanlon Gasoline Corporation at Breckenridge. This general subject was then opened for discussion and much interest in the problem of maintaining a good water supply was evidenced.

Wichita Fall Meeting

At Wichita Falls the program was very similar to that held at Ranger. Mr. D. A. Sillers again presented his paper dealing with gas measurement. In the discussion following the merits of different types of gravity balances and bottles were taken up. Mr. Sillers is the inventor of the Acme gravity balance.

Mr. L. O. Smith, superintendent of the Tidal-Western Refining Company gasoline plant at Burkburnett, presented one of the most comprehensive papers given at either meeting. His general title was "Plant Operations," and he covered each department of the gasoline manufacturing plant in excellent fashion.

At the night session Mr. Bourque talked on "Co-operation Between plant and Office," and M. V. Enright, superintendent in the Wichita Falls and Coleman districts for the Skelly Oil Company, delivered a highly interesting talk on vacuum problems.

At both meetings it is probable that more interest was evidenced in safety measures and first aid than in anything else, and the operators were all highly interested in the work of the first aid team which L. O. Smith produced at Wichita Falls, which efficiently demonstrated the method of prone pressure resuscitation, and other first aid practices.

These were the first meetings of the plant operators which this association has held, where papers were presented by the speakers, and since the method of presentation has proven both interesting and successful it is planned to ask the operators to present more papers at future meetings.

Cross Cracking Units For Plant in England

New York.—The M. W. Kellog Company announces that the Standard Oil Company of New Jersey has contract for two 2,000 barrel units of the Cross Cracking process to be installed immediately at a refinery located at Fawley, England.

Special Refinery Equipment

The Western Line Bubble Tower Castings

We are especially equipped and thoroughly experienced in the manufacture of castings for Bubble Towers.

For a quarter of a century we have specialized in steel and structural work, and we are especially equipped to manufacture and supply:

- Structural steel and iron.
- Plate and sheet work.
- Smoke stacks.
- Gray iron castings.
- Tank car repair parts.
- Dome covers.
- Outlet caps.
- Raw material from warehouse shipments.

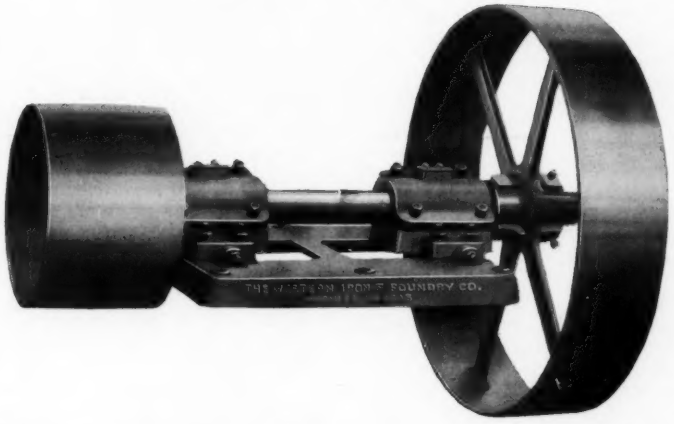
Prompt Delivery

Because of our location in the Mid-Continent field and our experience and complete facilities, we can probably make shipments in a shorter length of time than you have enjoyed before.

Freight Rates.

Because of our central location, refiners in the Mid-Continent field will effect a saving in freight rates which is no small item.

WRITE FOR CATALOG



Western Counter Shafts

WESTERN Counter Shafts are extra heavy and unusually durable. They are constructed of the highest grade materials, and are manufactured under expert supervision. Will withstand the severest strains. Carried in stock in all standard size pulleys and shafts; with end bearings, if preferred.

Western River Clamps

WESTERN RIVER Clamps fit flush and tight with pipe. Are smooth clean castings. They take the strain off the weld or coupling and prevent joints from breaking. Prompt shipment on standard sizes for pipe up to 16 inches.

Western Iron & Foundry Company

Established in 1902

Wichita, Kansas

Water Treatment at Gasoline Plants

Paper read before plant operators' meeting of the Association of Natural Gasoline Manufacturers, Ranger, Texas, March 22, 1927

By OTTO PETERS

Superintendent Brooks-Hanlon Gasoline Corporation

WHEN water treatment is mentioned to the gasoline plant operator the idea instantly concentrates on the harmful effects of impure water on the boiler and on the water jackets of engine power cylinders. The corrosion of plant piping exposed to the impure water is probably accepted as a secondary matter. The gasoline plant may derive its supply of water from a creek into which empties all the drainage from slush pits, waste oil, salt water dams, and incidentally, all refuse water and acids from the plant. Particularly during the rainy season is this water effected so that water treatment depends upon the kind of water it may be at the time of being treated. Above all things water should be carefully analyzed before treatment is adopted. Water treatment is quite a problem, the city treats water for domestic purposes, the manufacturer of ice has to treat his water, and the warship handling ocean water has a practice all its own from which no doubt much can be learned. In our practice of gasoline plant operation we are beginning to realize that something must be done to eliminate excessive upkeep costs due to the destructive effects of impure water. Water treatment is not to be confused with boiler compounds. There are scale removers and scale preventatives, and where these may be adopted due to apparent high cost of water treating, their use is limited for specific purposes, and indications are that ultimately the entire water supply for the plant will be treated. We plant operators know that this is one of our hardest problems, and where we are trained to understand the constituents of gases and the properties of gasoline, the time is at hand where we will have to have a broader knowledge of the impurities in water and their remedy.

Water may be classified by either of two methods.

1. By its chemical composition.
2. By its effect in use.

The second is manifestly what is wanted by the master mechanic or superintendent. The following may be placed in the first class.

A—Alkaline waters.

B—Non-alkaline, bad and good.

In the second class may be placed:

A—Those causing foaming and corrosion, but non-incrusting.

B—Hard or incrusting.

C—Soft, non-alkaline, and good.

These two classes are related as follows:

A—of class 1 will produce trouble in A of class 2.

B—of class 1 the bad non-alkaline, would be B of Class 2.

C—of class 2 soft waters, would include those having little mineral impurities of any kind.

In making analysis all ingredients are grouped broadly under two heads, incrusting and non-incrusting. Under the former are put such salts as are thrown out of solution by heat and under the latter, those which do not precipitate until great concentration occurs.

Testing Method

The hardness of water may be temporary, permanent, of both. Temporary hardness is caused by calcium and magnesium carbonates which are held in solution by the excess of carbon dioxide in the water. Boiling the water drives out the carbon dioxide and calcium magnesium carbonates are thereby precipitated. Permanent hardness is usually caused by magnesium chloride or calcium sulphate, which is not precipitated by boiling, the latter, however, can be precipitated out of boiler feed water by treating to 240 degrees F., which renders it insoluble.

Water may be classified as follows:

One to ten grains per gallon—soft water.

Ten to twenty grains per gallon—moderately hard water.

Twenty to fifty grains per gallon—very hard water.

In testing, the standard soap solution is used and it is made as follows: Dissolve 13 gramns of pure castile soap or sodium oleate in 500 c.c. of alcohol and 500 c.c. of water, now it becomes necessary to standardize so that 1 c.c. will be equivalent to 0.001 gramn of calcium carbonate. In order to effect this 12 c.c. of standard hard water are run into a 250 c.c. flask and diluted to 58.3 c.c. with distilled water, soap solution being run in at 1 c.c. at a time, shaking after each addition of soap solution until a permanent lather is obtained lasting five minutes, which should be 13 c.c. of soap solution equals 1 degree of hardness.

Troubles due to water, their prevention and cures could be arranged as follows:

Trouble—

1. Incrustation. (a) Cause: Sediment, mud, clay, etc. Readily soluble salts. Cure: Filtration. Blowing off.

(b) Cause: Bicarbonate of mag. Lime, iron. Cure: Heating feed and precipitate, caustic soda. Lime, mag.

(c) Cause: Organic matter. Sulphate of lime. Cure: Organic acids are neutralized by soda ash. Barium chloride.

2. Corrosion. (a) Cause: Organic matter. Cure: Precip. with alum. Precip. with ferric. Chloride and filter.

(b) Cause: Grease. Cure: Lime. Soda ash and filter.

(c) Cause: Chlorides of sulphates of mag. Sugars. Acids. Cure: Soda ash.

(d) Cause: Dissolved carbonic acid and oxygen. Cure: Lime, caustic soda and heating.

(e) Cause: Electrolitic action. Cure: Zinc plates (only in the absence of oxygen).

3. Priming. (a) Cause: Sewerage. Cure: Precip. with alum or ferric chloride and filter.

(b) Cause: Alkalies. Cure: Heating feed and precip.

(c) Cause: Carbonates of soda in large quantities. Cure: Barium chloride.

Treating Equipment

The plant equipment consists of four 1200-barrel wooden tanks, two of which are for storage of untreated water and two for the treated water. The difference between the two kinds of water is strikingly apparent, one is muddy looking and the other is clean and has the same greenish color as the ocean water. Two Dean Triplex 7x10 water pumps, each directly connected to a three phase 40 h.p. motor, are used to pump the treated water to the different points of delivery. Two turbines, each driven by a three phase 20 h.p. motor, are used to deliver water from the creek to the water filterer, also used for flushing of the water strainer and are so connected that in an emergency they replace the triplex pumps.

There is one steel tank four feet high and eight feet in diameter which is used as a mixing tank for the chemicals, and in it the solution is stirred by hand through the medium of spur gears attached to a paddle, stirring is also accomplished by circulation of the solution by means of a centrifugal pump which is motor driven. The filterer has a capacity of treating 9000 gallons of water per hour and it consists of a steel riveted tank 40 feet high and 12 feet in diameter, and in the center of it is a smaller tank 40 feet high, but 5 feet in diameter. The top of both tanks is open, and on ties laid across the top is assembled a narrow steel box 10 feet high, 6 feet long and 16 inches wide, this tank receives the water to be treated and through an overflow pipe it also operates a tripping device. To

Proven!

IF you will consider who the refiners are, both large and small, that now enjoy the advantages of the Lientz Recirculating System, you could not doubt its value. It has fully proven its ability to produce many important economies and benefits. The selection, therefore, of this system by the many refiners who are now users, should be sufficient to justify your consideration.

Over 100 Units Operating

Lientz Combustion Engineers will be glad to advise with and point out the many benefits this system offers you. This will be done, too, without obligation. Why not post yourself now and write today.

B. P. LIENTZ & COMPANY

KANSAS CITY, MO.

Ft. Worth · Los Angeles · New York City

The LIENTZ RECIRCULATING SYSTEM

Provides

MILD EVEN TEMPERATURES
LARGE VOLUME COMBUSTION GAS
INCREASED THRUPUT AND YIELD
REDUCED MAINTENANCE COST
AND A SUBSTANTIAL
SAVING IN FUEL!

one side is placed another steel tank four feet high and eight feet in diameter, which is called the chemical tank, alongside of it is a tripping device which controls its outlet and above this chemical tank is a small wooden tank in which alum is mixed.

The process of treating consists of diluting in the mixing tank 120 pounds of lime with 150 pounds of soda ash. This solution is then pumped by means of the centrifugal pump up into the chemical tank on the top of the filterer, also 15 barrels of alum is diluted with water to make a volume of about four barrels of mixture, which is fed into the chemical tank at a rate taking 24 hours. The chemical tank contents are continuously stirred automatically by a paddle attached to spur gears actuated by a paddle wheel extended on a rod into the water receiving box in which the water enters at the top so that in falling it revolves the paddle wheel. The water to be treated passes from the bottom of the receiving box into the top of five-foot diameter tank in center of filterer and as the water enters it comes in contact with the lime and soda ash, and alum solution leaving the chemical tank, which is fed to the water by means of a very ingenuous tipping device which is made of an iron box having suspended two brackets, one on each side of a ratchet arrangement so arranged that as the bucket is filled with water through the overflow line from water receiving box, it trips and operates the ratchet which is hooked to a level control inside the chemical tank, this is a slotted pipe used as outlet nipple from the chemical tank, so that where the buckets are set to fill with water within specified time limits, the stroke of the ratchet is either lengthened or shortened, in that way lowering the outlet nipple in the chemical tank so that so many drops of chemical solution are fed to the water every so many minutes. The water, after coming in contact with the chemical solution, passes through a suspended strainer which consists of several hundred minute holes covered by layers of gravel and sand so that in passing through the strainer the water is cleansed from chemicals. The strainer has to be cleaned and this is done by flushing it with water every 12 hours.

Gasoline Plant Operation

Paper read before meeting of plant operators of the Association of Natural Gasoline Manufacturers, Ranger, Texas, March 22, 1927

By C. A. EDWARDS

District Supt., Chestnut & Smith Corp., Ranger, Texas

GAS from the field before entering the plant should be passed through a scrubber. The interior of this scrubber should be a series of baffles, causing the gas to travel in a staggered direction. This travel would check the velocity of the gas to a certain extent, allowing the sand, pipe line rust and moisture to accumulate on these baffles which later will fall to the bottom of the scrubber. When the scrubber fills to a certain level, the sand will start coming over. The sand coming over accumulates in the suction header and compressor cylinders. The sand collecting in the cylinders and around compressor valves, decreases the capacity of the compressor and also cuts lubrication. The lack of lubrication causes excessive wear on pistons, piston rings and cylinder walls. In some cases where scrubbers are small or improperly designed, the sand will fall over to an extent that it will color the Field Low or first stage make. In most cases, this product is rerun in order to clarify before it is considered a salable product. Rerun loss on this product ranges from 12 to 15 per cent.

Field machines take the gas under vacuum and compress it to 30 or 35 pounds pressure, discharging into coolers or coil condensers. These coils are kept cool by water sprayed over them by the coil pit water circulating pump. Temperature of gas, inlet to coil range from 200 to 240 degrees Fahrenheit. Outlet temperature ranges from 60 to 90 degrees Fahrenheit. Amount of gasoline condensed by low-stage compression ranges from 15 to 30 per cent of total plant production, considering gas not less than 2 g.p.m. Amount of coil surface required for coil area ranges from 3½ to 5 square feet per horsepower used in compression. Vapor coils cooling area ranges from 7 to 10 square feet per horsepower used in compression, vapors ranging from 10 to 15 g.p.m.

Precipitation Surface

Amount of surface required for efficient precipitation of gasoline vapors coming from the knockout box depends primarily on the volume of vapors handled, amount of gasoline condensed and method of distillation. For steam distillation, temperature of 216 degrees Fahrenheit, pressure of 1 pound, coil surface required not less than 2 square feet per gallon of condensate per hour, fire distillation temperature ranging from 350 to 450 degrees Fahrenheit, pressure range from 2½ to 4 pounds. Amount of coil surface required, not less than 3 square feet per gallon of condensate per hour to be employed.

The average absorption plant requires about 2 lineal feet of 2-inch pipe per gallon of oil circulated per hour. The oil coil header pipe should provide for one stream for 1000 gallons of oil circulated per hour. This takes an average oil velocity of about 100 lineal feet per hour, and will provide a high enough velocity so as to insure efficient heat transfer. If inter-cooler coils are used to cool the oil as it is pumped from one absorber to another, the amount of cooling surface required should be about one-half that of the primary coolers. The oil coolers should preferably be put in a cooling tower by themselves. Cooling of oil is imperative from the viewpoint of maximum gasoline recovery. Insufficient oil cooling capacity has been responsible for low efficiency of gasoline extraction of a large number of plants.

Care should be taken in choosing the kind of pumps, since it is imperative that oil circulation be carefully regulated. For low pressure plants, centrifugal pumps are giving excellent service. A reserve oil pump should be provided. If pumps are driven with line shaft, operated with gas engine, it is advisable to have an auxiliary drive such as a steam engine, electric motor or a reserve gas engine. Where a surplus of residue gas is available, it may be used instead of steam to drive the reciprocating pumps.

Tests Daily

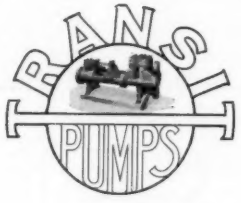
With oil temperature range from 50 to 70 degrees Fahrenheit when entering absorber, the average amount of oil required per 1000 cubic feet of gas passed ranges from 30 to 40 gallons with the g.p.m. ranging from 2½ to 4 gallons, with absorbing pressure of 35 pounds per square inch.

In order to determine the amount of stable gasoline escaping with the residue gas and thereby enabling the operator to obtain a better plant control daily, tests of the residue gas should be made daily, for the average value of gasoline, by means of a flow meter.

Fortunately, natural gasoline generally passes color test. At some plants off-color drip is collected. In such instances, a small fire still is used to refine the product. Occasionally, natural gasoline is made off-color due to presence of lubricating oil accumulating in the compressors. At oil absorption plants, there is always the possibility of the aborbent oil discoloring the product. Liquid level controls and vigilant operators are the only safeguards against this.

U. S. Supreme Court Says:

"Good Will is the disposition of the pleased customer to return to the place where he has been well treated."



This strikes us as the best thing we have read in many a day—a pure, straightforward definition admirably expressed. Good Will is something we have always intentionally cultivated, so we would ask to be judged accordingly.

Every TRANSIT customer is well treated by receiving a good honest product at a very fair price. We sell nothing shoddy, cheap, nor any makeshifts, but only products which we thoroughly believe in ourselves.

And our customers return.

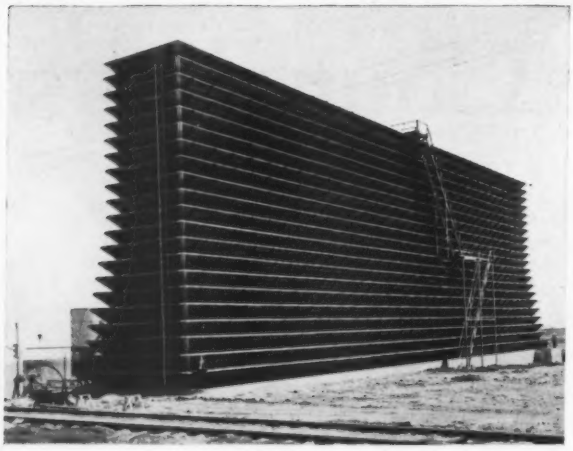
We have many who have bought consistently from us for thirty-five to forty years. In that time many have come, and—a few have gone, as go they will, but all have been treated the same; the best we know how.

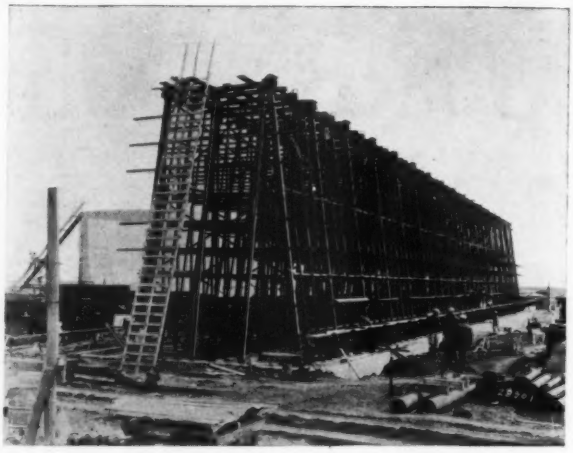
A good way to test us would be to have us bid on your next pumping job. We assure you we will do everything to make you at least a pleased prospective customer.

NATIONAL TRANSIT
Pump & Machine Company

Oil City, Pa.

New York **Cleveland** **Philadelphia** **Pittsburgh**
Denver **Houston** **Tulsa**



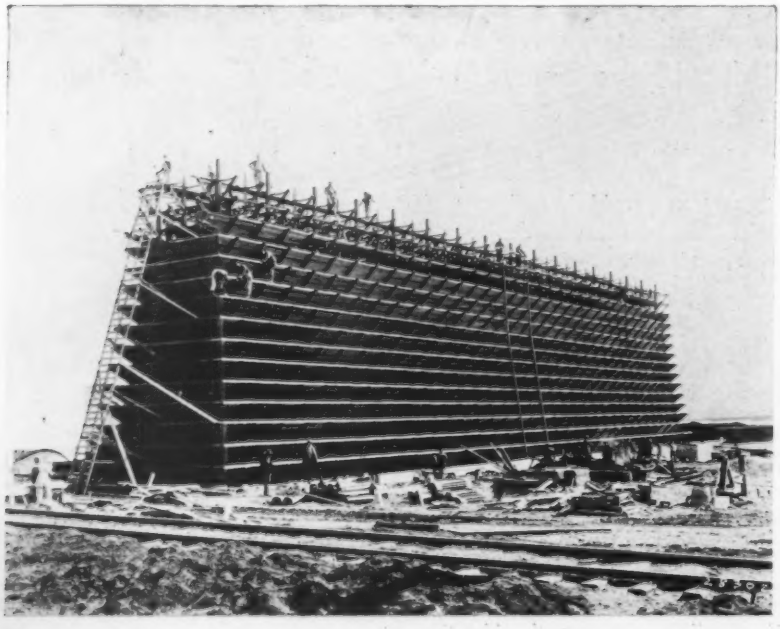


Long Range Cooling Tower for An Oil Refinery

By LOUIS A. PHILLIPS, M. E.
Vice-President of The Cooling Tower Co., Inc.

WHEN the writer was first asked to supply a tower that would cool water from 150 degrees to within 5 degrees of the wet bulb temperature, he felt that there must be some mistake in the request to furnish such a tower; first, because the same tower that will cool to within one-half degree of the wet bulb under certain atmospheric conditions, that is when the wet bulb and the dry bulb are close together, will not cool to within 10 or 12 degrees of the wet bulb when the wet bulb and dry bulb are far apart, as when the wet bulb is 20 degrees or more below the dry bulb. No guarantee can be made to cool always within 5 degrees of the wet bulb.

Second, the writer knew that a great many people in speaking of the wet bulb referred to the stationary wet bulb, which, of course, does not give a true reading and unless there is considerable wind blowing will register a good deal higher than the true wet bulb than most people seem to realize. For instance, the stationary wet bulb may show a depression of 12 degrees whereas the sling psychrometer would, under the same atmospheric conditions, show a depression of 14½ degrees, 2½ degrees difference may not appear as much of a range in temperature but when you are cooling to temperatures below the dry bulb even one degree in cooling may mean a good many feet added to the height of the tower. Frequently cooling towers that have been reported as showing wonderful cooling efficiency have been tested with stationary wet bulb and therefore the showing is not due so much to the efficiency of the tower as to the lack of knowledge of the man making test as to what constitutes a true wet bulb reading.



A third reason that made us feel such an inquiry might be a mistake was due to the fact that a tower half the height of the one necessary to figure on gave the most economical installation considering both first cost and efficiency.

This matter was thoroughly thrashed out with the engineers of the Marland Refining Company, the writer spending a week going into these matters with them and the upshot of the matter was the construction of the tower shown in the accompanying photograph, Figure 1.

60 Feet High

This tower is 60 feet high, has 20 decks and cools from 150 degrees to 75 degrees with a wet bulb temperature of 70 degrees or within five degrees of the true wet bulb. If wet bulb temperature should be taken by stationary

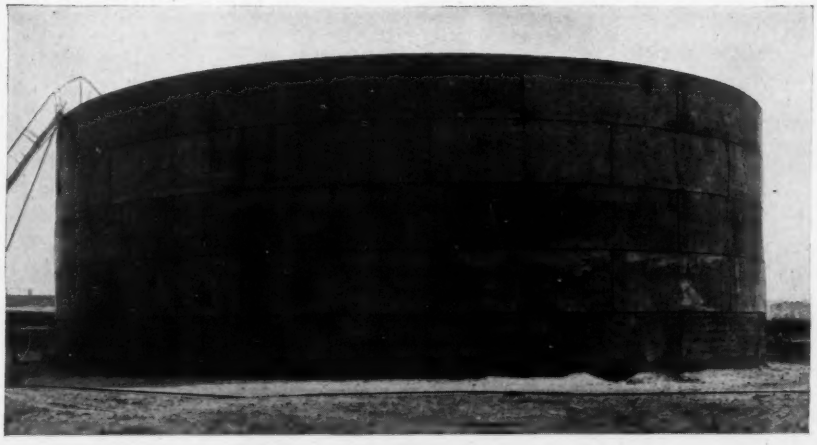
Strength You Can Depend Upon

The SUPER STRENGTH built into every piece of KAW refinery equipment is a quality you can depend upon to save you time, trouble and money. It is a strength that withstands the ravages of time and weather. It is a strength that pays dividends in worry-free reliability year after year.

Let the strong, durable, economical qualities of KAW products give you the assurance of equipment you can depend upon to deliver the day-in and day-out service you want.

Write, wire or phone for specifications and prices now on Horizontal Tanks, Condenser Boxes, Rundown Tanks, Storage Tanks, Agitators, Towers, Stacks or Stills.

KAW



THE KAW STEEL CONSTRUCTION CO.

General Office and Plant: 1st and Walker Ave. Kansas City, Kansas

wet bulb the tower would cool to within about 2½ degrees of the wet bulb.

The upper half of this tower is built like the standard Type "G" tower furnished by The Cooling Tower Company but the lower half is made with a batter. Figure 2 shows the frame work of the lower half of the tower while in the course of erection, and cut Figure 3 shows this same work with the louvres in place and before the upper half of the tower had been erected.

The lower half of the tower being battered or spread serves several purposes. First, it adds stability to the tower. This 60 foot tower will resist hurricanes and high winds without damage. A number of towers built like the upper half have come through hurricanes in the past, undamaged by the storms.

The spreading of the base of the tower allows for a larger collecting basin underneath the tower, so important in refineries where they are obliged to carry a large reservoir of water to meet emergencies such as a fire as well as because a copious supply of water at a refinery is the next best thing to a good supply of oil.

There is a third reason for spreading the base of the tower which is not so well understood. This construction provides the additional cooling surface needed under a high wind velocity. To make this more plain it has been found that a tower of half of the height of the tower shown does not require any arrangement to keep the water spread over the decks as the water descends, provided original distribution is properly arranged. An increase in wind velocity causes the blowing of the water towards one side of the tower. That extra increase in wind velocity provides enough extra air so that the cooling will be as good with less deck area or a greater density of water per square foot of deck.

Now this is all right for the 30 foot tower. But in making the tower 60 feet and keeping sides vertical all the way up, the water would, under high wind velocity and after getting about half way through the tower, cling to the leaward side of the tower, running down the edge of the louvres instead of spreading out over the decks.

The decks, being wider in this battered section, allow for the spreading out of the water.

The writer, in common with others, has tried putting in gutter sections half way up the tower to carry the water back to the windward side of the tower but has long since given up any such ideas as the water simply will not run back against the wind pressure and the idea of a redistributing deck part way up the tower has been found of little value.

The facts are that the tower should be designed large enough so that the cooling required will be done with practically no wind velocity. When the tower is so designed that there is no necessity of a redistributing deck, the wind velocity provides enough extra air to make up for the heavy density of water in that part of the tower where the water is falling. This has been found to be true until the tower reaches such a height that the water is practically all thrown up against the leaward louvres and this condition only occurs in especially high towers.

Before this tower was started the writer's contention was that water would not be delivered to the tower as high as 150 degrees and two or three degrees less in approach to the wet bulb would not make any particular difference, and in fact that is about the condition that exists in the operation of cooling towers at most refineries, but since the installation of this tower it has been found that the ironing out of the varying final temperature in the cooling water has been a great advantage.

It is true that the water seldom goes to this tower at a temperature higher than 125 degrees and usually it comes off at a temperature of about 4 degrees above the wet bulb and the highest temperature of water to this tower so far recorded is 144 degrees.

Initial Temperature Immaterial

The great advantage has been that the water coming from the tower maintains practically the same temperature regardless of the temperature of the water going to the tower, and this means doing away with a lot of shifting of cooling water to the various ammonia condensers, stills, interchangers, etc., used throughout refineries.

The 70-degree wet bulb is the July average for the locality so the result is that under the average July condition the water comes off this tower from 74 degrees to 75 degrees regardless of whether the water to the tower enters at 100 degrees or 150 degrees.

Records have been kept of the daily and often hourly performance of this tower and true wet bulbs have been taken with a sling psychrometer as well as stationary wet bulb readings so that the performance of the tower has been checked in every way against the cooling results it was designed to accomplish.

These records taken in connectionn with the daily observed benefits from a supply of cold water at a uniform temperature with a varied temperature of hot water to the tower, have shown the advantage and wisdom of the extra money spent in making an installation of this kind, even though there are times when the water going to the tower is at a sufficiently low temperature so that there is practically no cooling throughout a considerable distance of height in the lower part of the tower. Of course, under such conditions the tower might just as well have been installed say 15, 20 or 30 feet lower, but when the high temperature water does come to the tower with perhaps no notice whatever the tower is right there to still return the cold water at the same low temperature, which it would not do if it had not been designed to handle this long range and still cool to a low temperature.

Michigan U. Offers New Courses

The University of Michigan, Ann Arbor, has issued a 1927 catalog, covering several new courses added to its engineering dpartment.

These include a course on petroleum refinery engineering, a course on petroleum and motor fuels, courses dealing with distillation, furnace design and construction, and others dealing with such subjects as heat transfer, materials of construction, fuels and related topics of basic importance in refinery practice.

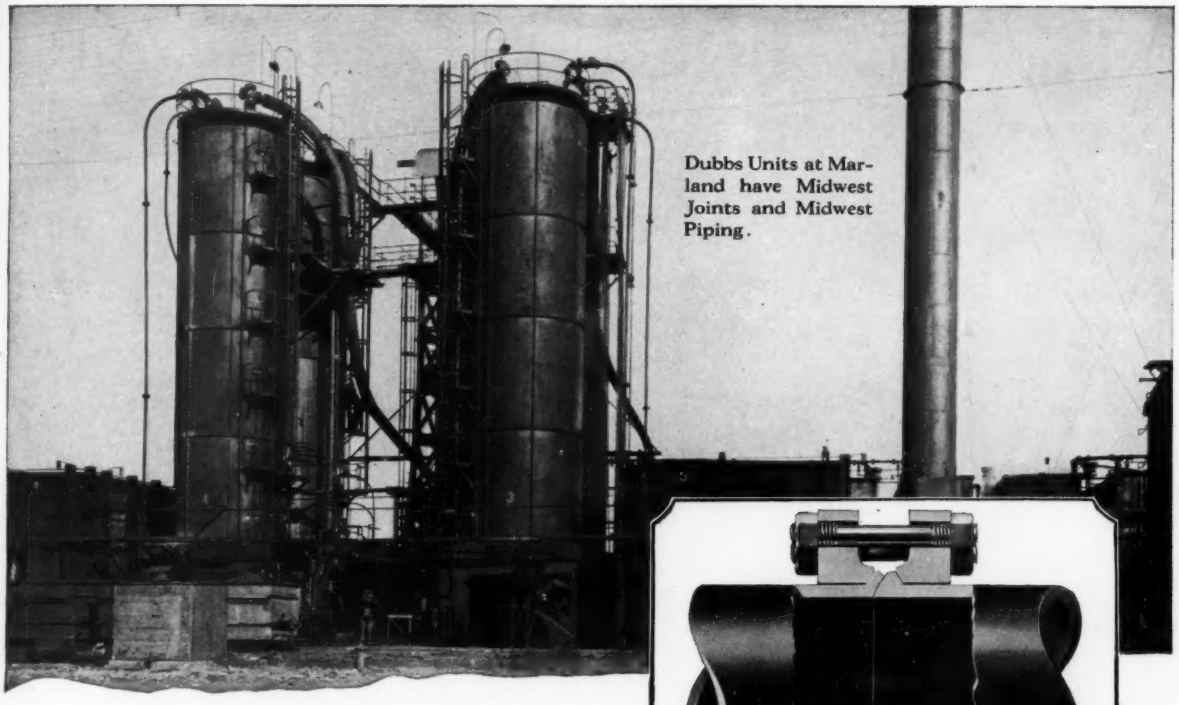
Further information may be obtained by writing the university for its program in Chemical Engineering and Graduate Courses in General Chemical Engineering, Metallurgical Engineering, Gas Engineering, and Organic Chemical Industries.

Richfield's Seal Beach Plant Operating

Los Angeles. —The Richfield Oil Company's newest natural gasoline plant, recently erected at Seal Beach, just at the southern edge of this new field, is now in operation. The installation is a complete Campbell Oil Froth type, embracing the latest designed equipment of the Campbell type. Production at the plant when first put into operation averaged 6500 gallons of gasoline daily, which is about one-half of the plant's rated capacity. Increased production will come with the development of the field and larger production of natural gas. Seal Beach gas production is reported to have a gasoline content of around four gallons per thousand cubic feet—which is considered as a rich gas in California.

Build Colorado Gasoline Plant

Denver, Colo.—Twenty eight miles southeast of Trinidad, the Mountain States Gasoline Corporation, controlled by the Barnhart Brothers of Denver, is installing a 6,000-gallon daily capacity gasoline extraction plant which is to be in operation by April 1. Gas from the company's wells in San Francisco canyon will be treated, its gasoline content testing about three gallons per thousand cubic feet. The first well of the group was drilled 31 years ago and has been flowing wet gas ever since.



Dubbs Units at Marland have Midwest Joints and Midwest Piping.

Midwest Joints reduce refinery fire hazards

THAT is one of the important reasons why Midwest Joints have so rapidly gained favor among the refiners who are familiar with the unusual service records of Midwest Joints upon hot oil and vapor lines carrying pressures to 500 lbs. and having temperatures that reach 1000° F.

Midwest Joints require no gaskets—there is nothing to blow out and cause the flash and fire that so frequently results in serious loss of property, loss of capacity and sometimes even loss of life.

Midwest Joints are made between specially machined convex and concave spherical surfaces integral with pipes, valves and fittings. Tight joints are assured regardless of piping alignment while correct alignment is essential with joints of other types. Midwest Joints make piping erection more easy and less expensive—this is another important feature.

We shall be glad to give you complete information regarding Midwest Joints without obligation on your part. Ask for Circular O-2.

MIDWEST PIPING & SUPPLY COMPANY

Second and Miller Sts.
SAINT LOUIS, MISSOURI

Tulsa Office: 805 Mayo Building Chicago Office: 208 South La Salle St.

Fabricators of Oil Refinery, Natural Gasoline Plant and Power Piping

MIDWEST GASKETLESS JOINTS

Mention Where You Saw the Advertisement

The Microanalysis Lucricating Oils

The Vogel-Ossag viscosimeter and flash point determination in small crucible

*By G. MEYERHEIM and FR. FRANK**
Chemisches Laboratorium f. Handel u. Industrie, Berlin, 1.

THE usual carrying out of a lubricating oil examination presupposes the availability of at least a quarter of a liter of material, as already the charging of an Engler viscosimeter calls for 240 cc. of oil. Often, however, it happens that such a large quantity is not available, due to the small amount of the sample furnished or due to the impossibility of obtaining a larger sample, such as in cases as where samples are taken from certain lubricating parts of machinery. Now, however, it is feasible to make use of the Engler apparatus with amounts of oil smaller than 240 cc. The transportation factors for the different charge and discharge quantities have been determined by Gans, Offermann and Edeleanu, for instance in use of 120/100 cc. 60/50 cc. down to 25/10 cc.

These determinations, however, are dependent upon certain contingencies. On the pouring off of the oil which has been warmed in the measuring cylinder to a little above the temperature of the test, smaller or larger quantities of oil remain attached to the walls, depending upon the degree of viscosity. Furthermore, already in case of a charge of 60 cc. the thermometer vessel has only its extreme point immersed in the oil, so that an exact determination of the temperature is no longer possible. These shortcomings have led to the construction of the Ubbelohde "decimal container,"[2] which can be screwed on to Engler apparatus and requires only 25 cc. of oil. The norm of this "decimal container," i.e., the discharge of 20 cc. of water at 20 C. requires about 5 seconds, and is, according to the statement of Holde, difficult to measure with sufficient accuracy, so that a certification by the Physikalisch-Technische Reichsanstalt is always necessary. The measuring of the time of outflow of thin lubricating oils, also, is equally difficult, so that the determination of viscosity by means of the "decimal container," is at the most a perfunctory one, and the values so obtained are to be considered as approximate only. The Metal viscosimeter constructed by Holde[3] which eliminates the defects of the Engler apparatus requires 120 cc. oil for a normal charge, charges with smaller amounts show the same uncertainty of results as are encountered in the use of the old Engler apparatus. Accordingly, the only apparatus remaining, available for the exact determination of the viscosity of oils with a small amount of material is the capillary viscosimeter of Ostwald and Traube, improved by Ubbelohde-Holde,[1] which, particularly on account of the readily broken glass capillaries is not a desirable instrument.

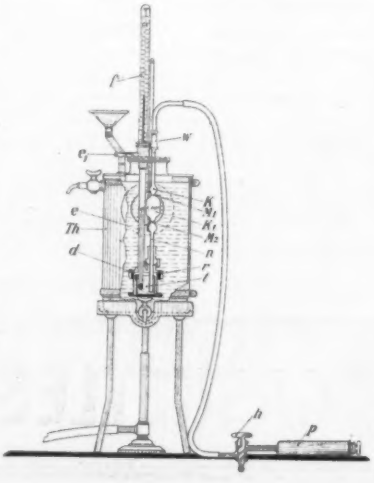
H. Vogel (Rhenania-Ossag, Hamburg), has now constructed an Ostwald Capillary viscosimeter which is both convenient and durable which with a single charge of oil, about 15 cc. allows the determination of a perfect viscosity curve. The oil flows out by gravity, and encircling the oil container is a gallery compartment into which the oil flows as it expands on increase of temperature, so that the height of pressure remains automatically constant. The kinematic viscosity $Vk = \frac{100n}{s}$ is obtained directly with the apparatus. In the above formula n represents the absolute viscosity of the oil, s represents the specific gravity at the temperature of the determination. Thus it is but necessary to multiply the kinematic viscosity value obtained with the specific gravity of the oil in order to obtain directly the absolute viscosity in centipoises. But so long as neither the dealer in nor the consumer of lubricating oils has learned to derive the only possible comparison of the viscosity of the oils from the absolute viscosity values, formulae are necessary in order to calculate the Engler, Redwood, or Saybolt degree from the kinematic viscosity obtained with the Vogel-Ossag viscosimeter. The formula for this purpose as given by Vogel, is:

$$\frac{n}{s} = a\left(1 - \frac{1}{T^3 \cdot f(t)}\right).$$

Here a signifies the apparatus-constant which in the Engler apparatus is 7.6, T represents relation of time of discharge of the oil to time of discharge of water at 20.2 C, f(t) represents the temperature of Engler apparatus. The expression $\frac{1}{T^3}$ signifies the correction for turbulence which for large values rapidly approaches 1. In order to facilitate calculations, Vogel has given a table which allows the Engler, Redwood, and Saybold degrees equivalent to kinematic viscosity values of from 1 to 60 to be read directly. In the case of values of over 60 they can be obtained through the same formula

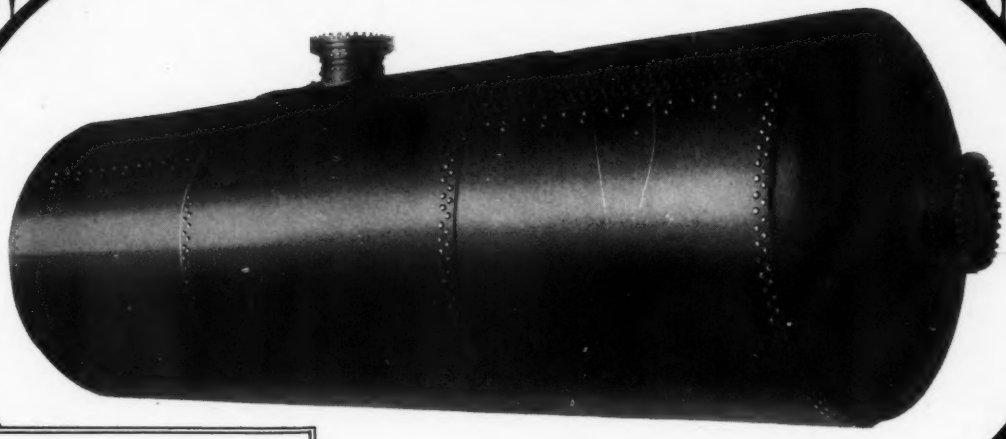
Engler degree E=O. 132Vk

The use of the Vogel-Ossag viscosimeter as can be seen from the instructions accompanying the same is exceedingly simple. The cylindrical vessel t is filled with the oil to the rim, the covered d with the capillary n is put on. By means of the pump p, a portion of the oil is raised into the bub K_1, so as to make possible a complete filling of the container t, also after the cover has been screwed down. With the cock 2 closed the lid is now screwed fast, and the apparatus so prepared is placed in the bath in such a manner that there be no overflow of the oil into the gallery through an inclining of the apparatus. The thermometer f is then inserted into the air vent tube e. The bath is then brought to the exact temperature at which the determination is to be made. For temperatures up to 100C water is used, for temperatures above 100C a thin oil can be utilized. The outer heating bath is to be maintained at a temperature about 6% in excess of that of the inner bath. When the temperature required has been attained, oil is drawn into the bulb K by means of the pump p. It is allowed to remain a little while until a uniform distribution of temperature is certain, then it is allowed to flow out by gravity, the



*Translated by Universal Trade Press Syndicate.
1. From Zeitschrift f. Aug. Chemie Nov. 25, 1926. Vol. 39, page 1451.
2. K. Scheel, Petroleum 12, 873 (1917).
3. Holde, Kohlenwasserstoffole u. Fette 6. Aufl. S. 30.

STRUTHERS-WELLS Steel Plate Construction



Special Type High Pressure Cracking Still of Struthers-Wells construction — made for large Mid-Continent refiner.

257 of These Stills Now in Use

Six years ago one of the largest Mid-Continent refiners placed an order with us for a special type still, as shown in the illustration. Since that time, orders for 257 of these stills have been received and you will find them giving the very best of service in all the large refineries of this company.

That surely is significant evidence of the dependability and satisfaction of Struthers-Wells products.

Operating the largest electric welding plant in the country it is possible for us to manufacture pressure and vacuum stills of welded or riveted construction. Send us your specifications.

FOUNDERS—MACHINISTS
BUILDERS OF SPECIAL MACHINERY

STRUTHERS-WELLS PRODUCTS FOR REFINERIES

Bubble Towers
Heat Exchangers
Dephlegmators
Condensers
Distillate Separators
Grease Mixing Kettles

STRUTHERS-WELLS CO

WARREN, PENNA.

MANUFACTURERS — ENGINEERS

Seventy - Five Years of Accumulated Experience at your Service.

Steel Plate Construction

CHEMICAL — REFINING — RUBBER

Branch offices in principal cities

"Anything in Steel Plate construction of Stainless Steel."

pump hose connection at w having been disconnected. The amount of time consumed by the oil in descending from the mark M_1 to the Mark M_2 is obtained with a stop watch. The calculation of the kinematic viscosity is done by division of the time for discharge T in seconds and the volume content of capillary k in accordance with the formula

$$Vk = \frac{T}{k}$$

In order to obtain the capillary content factor k one is still dependent upon the Engler apparatus. It is obtained with an oil in the Engler viscosimeter at a fixed temperature, say 50 C., certified thermometers being used and all necessary precautions being observed. The Engler degree having thus been accurately ascertained, use is made of the table furnished with the Vogel-Ossag viscosimeter, taking from this table the value of V corresponding to the Engler degree obtained. Then a determination on the same oil at the same temperature is made on the Vogel-Ossag viscosimeter, the time of discharge T being obtained, identical precautions being observed.

The formula $Vk = \frac{T}{k}$ furnishes the calibration value k of the capillary. Ordinarily the apparatus is accompanied with a set of three capillaries, the calibration value for which are about 1 for the widest, about 4 for the intermediate one, and about 14- 15 for the narrowest one. Capillary one serves for very viscid oils, No. 2 is intended for moderately thick, and No. 3 for thin oils. For viscosity determinations a capillary should be selected, as far as possible, which will allow a discharge in not over 20 minutes, but in no case in no less than 20 seconds. If the time consumed for a discharge runs below 20 seconds, turbulency will occur, which causes an apparent increase of viscosity, thus leading to incorrect results.

The great advantage of the Vogel-Ossag viscosimeter over other viscosimeters consists in that it is possible to elevate the oil into the bulb again as often as is desired, which makes it possible to make redeterminations of the viscosity, without incurring the necessity of rewarming the oil, adjusting it anew to the mark or making use of a fresh viscosimeter flask, as for example, in the case of the Engler apparatus. The only disadvantage with the Vogel-Ossag viscosimeter, which so far has been noted in the course of several hundreds of determinations, is the difficulty incurred in the testing of thick and very dark oils. It has namely occurred repeatedly, though rarely that the film of oil adhering to the glass walls is so non-transparent that even with an intensive illumination an exact reading of the passage of the oil is impossible, otherwise in all determinations, this apparatus has shown itself to be faultless and reliable. Care should be taken to always work up from a lower to a higher temperature, and not the reverse, so that the oil container is always filled. Should it happen, on any occasion, through negligence, that the temperature goes too high, all that is necessary is but to allow a portion of the oil to be drawn from the container t into the bulb K and allow it to remain there until the proper drop in temperature has occurred in order to avoid an unintentional flow of oil into the gallery. The values obtained show agreement as the following determinations show:

Time of discharge: 56.5 sec.; 56.3 sec.; 56.0 sec.; 56.0 sec.-1 min. 51.4 sec.; 1 min. 51.8 sec.;1 min. 51.2 sec.- 2 min. 4.0 sec.; 2 min. 3.7 sec.; 2 min. 4.0 sec.- 8 min. 56.4 sec.; 8 min. 58.7 sec. That the viscosity values obtained on the Vogel-Ossag viscosimeter when transposed into terms of Engler degrees agree well with the direct viscosity determinations made with the Engler apparatus the accompanying table 1 will show.

Table 1

Oil	Temperature degrees	Discharge time seconds	$Vk = \frac{100n}{s}$	Engler degree calo. from	Engler degree direct det.
A	20	4266	1207,7	159,4	160,7
	35	1164,8	329,7	43,52	43,54
	50	429,7	121,63	16,06	16,06
	65	187,8	53,14	7,03	7,33
	80	100,8	28,52	3,89	3,99
B	20	1533,8	434,2	57,32	56,83
	35	493,7	139,7	18,45	18,02
	50	204,0	57,75	7,62	7,42
	65	101,6	28,76	3,93	3,97
	80	57,7	16,33	2,47	2,44
C	20	509,2	144,1	19,03	19,00
	35	215,1	60,89	8,04	7,89
	50	107,1	30,32	4,13	4,06
	65	60,2	17,04	2,54	2,56
	80	38,4	10,87	1,916	1,95
D	20	621,4	176,0	23,22	23,02
	35	229,6	65,0	8,58	8,54
	50	105,8	29,95	4,08	4,09
	65	56,8	16,10	2,44	2,48
	80	35,1	9,93	1,82	1,86
E	20	4377	1233	163,55	167,4
	35	1388	390,9	51,60	51,8
	50	557,8	157,9	20,84	20,12
	65	259.6	73,50	9,70	9,56
	80	138,8	39,29	5,25	5,07
F	20	2454	694,7	91,69	91,50
	35	706,0	199,85	26,38	27,06
	50	291,0	82,37	10,87	10,80
	65	139,9	39,10	5,29	5,39
	80	78,1	22,11	3,12	3,21

These results show that by means of the Vogel-Ossag Viscosimeter it becomes possible with the use of 15 cc of oil to obtain the viscosity curve with sufficient accuracy.

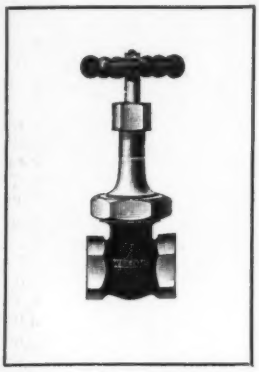
Flashpoint Determinations

When the flash point is concerned a certain difficulty offers itself in the use of small samples, as the customary porcelain crucible of 4x4 cm according to Marcusson requires about 40 cc of oil. It has, however, been possible using

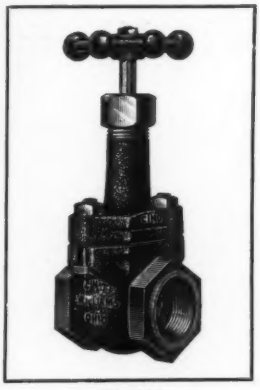
Table 2

	Flashpoint With Small Amount Temp.	Flashpoint Normal Temp.	Burning Point With Small Amount Temp.	Burning Point Normal Temp.
Distillate	105	107	133	124
Crude Oil	119	123	189	169
Heavy Oil	132	129	159	159
Spindle Oil	139	140	170	165
Transformer Oil	158	161	194	189
Transformer Oil	162	163	202	192
Transformer Oil	177	174	213	204
Machine Oil	177	183	206	212
Gas Oil (?)	200	200	243	228
Lubricating Oil	200	198	262	257
Motor Oil	207	208	257	246
Motor Oil	222	222	275	260
Pump Oil	227	225	278	269
Lubricating Oil	230	229	285	270
Auto Oil	227	232	287	283
Motor Oil	242	242	297	284
Cylinder Oil	269	269	335	314
Motor Oil	290	283	363	336
Cylinder Oil	327	319	...	...

Protect the Vital Points



No. 127
Bronze Gate Valve
For 200 lbs. pressure.
Sizes ¼" to 3"



No. 300
"Cino" Iron Gate Valve
For 125 lbs. pressure.
Sizes ¼" to 3"

No. 131
Bronze Quick Opening Gate Valve
For 200 lbs. pressure.
Sizes ½" to 4"

At hundreds of points valves are the direct guardians of the bank account, standing between the waste of heat, cold and pressures that means precious fuel lost and the leakage of acids, gases or other materials. Among the smallest of equipment in the power and manufacturing plant and refineries, valves may shut down great boilers, stop machines or processes, hold up production and ruin products—if they fail.

Poor valves are expensive at any price, and good valves are cheap at the highest price.

Williams Valves are the loyal, capable guardians that never fail, never disappoint and are faithful to the service for which each is built.

At thousands of vital points in every kind of industrial plant—on land and sea—Williams Valves are guarding the power, processes and profits of industry.

The name "Williams" on a valve is at once a safeguard against accident, a surety of service and the sign of lowest cost per year of use.

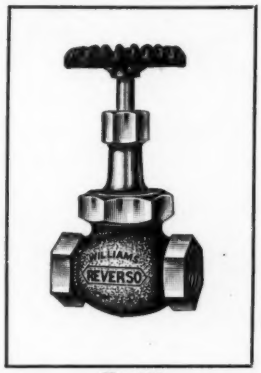
"Williams" is the general guarantee of specific valve service for each valve type we make, one of which fully meets each need in most advanced engineering practice.

If you want maximum valve service at minimum expense—specify "WILLIAMS" on your next order. Your dealer can supply you.

The D. T. Williams Valve Co.

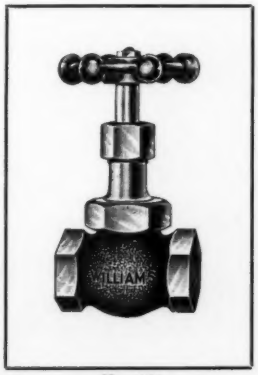
Cincinnati, Ohio.

Makers of High Grade Bronze and Iron, Regrinding and Nickel Seat Stop and Check Valves, Gate, Blowoff, Hydraulic, Swing and Ball Check, Needle, Hose, Whistle Valves, Stop and Air Cocks, Unions, Fittings, Water Gauges, Gauge Cocks, Oil Gauges, Lubricators, Oil and Grease Cups, Steam Traps, Separators.



No. 780
"Reverso" Bronze Globe Valve
Reversible Nickel Disc and Seat. For 200 lbs. pressure.
Sizes ½" to 3"

No. 460
"Iroverso" Iron Globe Valve.
Bronze Mounted Reversible Nickel Disc and Seat.
For 150 lbs. pressure.
Sizes ¼" to 2"



No. 107
Bronze Regrinding Valve
For 200 lbs. pressure
Size ⅛" to 3"

Williams Valves

Mention Where You Saw the Advertisement

only 10 cc oil to get reliable flashpoint and burning-point determinations. This was carried out in the following manner: a small porcelain crucible about 27.5 mm in height and of a width of 35 mm at the top and 17.5 mm at the bottom is used, it is filled up to within 6 mm of the edge with the oil to be tested. The crucible thus charged is imbedded in the sand of the flashpoint apparatus up to the level of the oil. The flashpoint thermometer is fastened above it so that the mercury is in the middle of the oil charge in the crucible. The ignition flame is then carried to and fro on a level with the edge of the crucible during the heating in the customary manner.

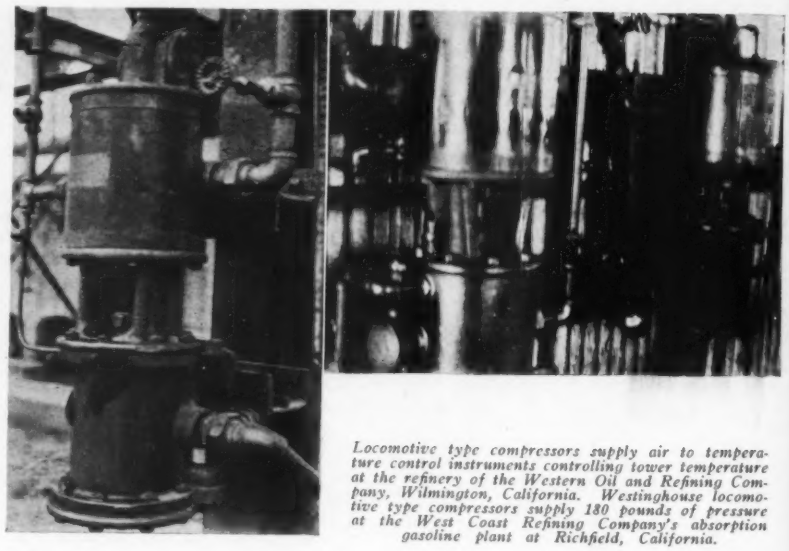
Table 2 shows the extent to which the results obtained agree with those obtained by the usual method of determination of the flashpoint and of the burning point.

According to the statement in "Richtlinien"* there is a latitude of +
— 5 degrees in flashpoint determinations. The variations noted in the determinations made with small amount of material are mostly smaller and remain within this latitude. It is not possible to obtain a clear insight into the causes of the variations in the values obtained for the burning point. Possibly in these determinations the surface of the oil plays a greater role than in the case of the discharge of vapor into the surrounding air in the flashpoint determination.

These results show that it is possible to carry out a fully exact examination of a lubricating oil with 20 or even with 15 cc of material, the viscosity and the viscosity curve being obtained with the Vogel-Ossag apparatus, then the specific gravity is taken in a 10cc pycnometer, the acidity determination made on a 5 grm. sample, the flashpoint ascertained with a small amount of material, this latter being utilized for the ash content determination which is made in the same crucible as the flashpoint determination.

In the carrying out of the control determinations we have been most kindly aided by Dr. Hedwig Ramer and by Dr. H. Selberg to whom we here express our profound thanks. We must especially, also express our thanks to the Verein deutscher Ingenieure who supported the work which was carried out jointly in the interest of the Arbeits-programms des Deutschen Verbandes fur die Materialprufungen der Technik. Comments upon the subjects dealt with are invited by the author or by the society mentioned as far as possible up to April 1, 1927. Deutscher-Verband fur die Materialprufungen der Technik, Berlin NW7, Friedrich-Ebert Strasse 27.

*Richtlinien fuer den Einkauf und die Pruefung von Schmiermittln; herausgegeben vom Verein deutscher Eisenhuettenleute und dem Deutschen Verband fuer die Materialpruefurgen der Technik. 4 Aufl., 1925, p. 58.



Locomotive type compressors supply air to temperature control instruments controlling tower temperature at the refinery of the Western Oil and Refining Company, Wilmington, California. Westinghouse locomotive type compressors supply 180 pounds of pressure at the West Coast Refining Company's absorption gasoline plant at Richfield, California.

Locomotive Type Air Compressors Find Place in Smaller Plants

THE constant and unvarying supply of compressed air is often a problem of great importance to the uninterrupted operation of refining and gasoline plants. To those engaged in the operation of installations of either type the importance of a reliable and unfailing air unit is immediately recognized and the installation of this type of equipment is among the first items given consideration. The industry spends thousands of dollars annually in the purchase and maintenance of compressors for use in the various departments of the natural gasoline and crude refining plants. Certain of the larger refineries have solved this problem by the installation of large centrally located air compressor units or "air plants," which involve the expenditure of quite a neat sum of money, and which are usually attended in their operation, by individual operators.

On the smaller refining plant, however, and the compactly designed natural gasoline plant, the quantity of compressed air required in general does not usually justify the installation of such units.

While visiting plants on the West Coast, the writer has often noticed the tendency of operators toward the employment of small, compact, easily handled, air brake or locomotive type air compressors.

Two compressors of this type,—Westinghouse locomotive or air brake type, one being a relief unit, are employed to maintain a constant supply of compressed air at 180 pounds pressure per square inch for use in all departments of the absorption gasoline plant of the West Coast Refining Company, at Richfield, California. The air is used in controlling many automatic temperature control valves about the plant equipment, for the plant garage, as well as for starting the large gas engines in the "booster" plant supplying natural gas to the absorption installation. The compressors have been in practically uninterruped service for more than a year, requiring very little attention. They are set at 180 pounds and maintain this pressure through automatic regulation.

At the plant of the Western Oil & Refining Company at Wilmington, California, the towers, or dephlegmators are all subjected to temperature control through the installation of individual Foxboro automatic recorder controllers. In this connection the company has installed a Westinghouse locomotive type air compressor for the purpose of providing a constant supply of compressed air for the operation of the several control instruments. The air machines are automatic in their operation and according to the plant manager, are comparatively inexpensive in cost, and besides requiring very little space for installing, also require but a minimum of attention. It is explained that they can be set to the required pressure, 30 pounds in this instance, and due to the automatic control feature will maintain this pressure—either building up or cutting out when the set pressure is reached. They can be set for operation, supplied with steam, and except for occasional inspection, can be almost forgotten.

80% *or* 56% Efficient
Your steam plant is—*which?*

ACCORDING to Mr. Fred R. Low, nationally known editor of "Power," it has been estimated that the average steam plant is only 56% efficient. Yet Mr. Low says "with intelligent adoption of available apparatus, 80% is easily obtainable even in moderate sized plants."

Where modernizing power plants, the first thought of the consulting or operating engineer is *flow meters*. Yet only about 25% of all the steam plants in this country have flow meters.

FLOW METERS HELP YOU OBTAIN 80%

Now the flow meter needs of steam plants can be adequately met. With the new Brown Electric Flow Meter old flow meter drawbacks have been completely eliminated.

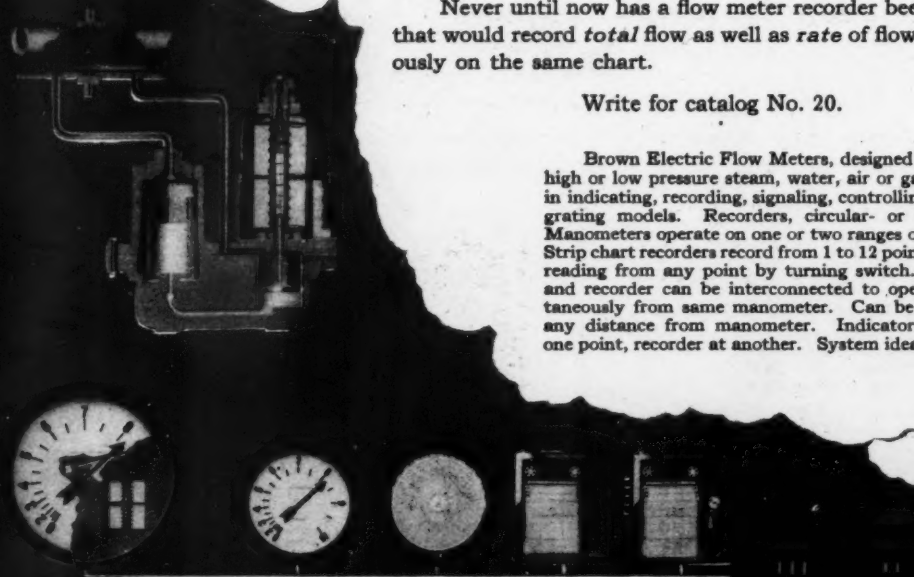
Never before has so complete a flow meter line been available. Never, were flow meter users offered a strip-chart recorder until the Brown Electric Flow Meter was introduced.

Never before has a flow meter manometer been produced with two distinct pressure ranges—changed by turning a valve.

Never until now has a flow meter recorder been available that would record *total* flow as well as *rate* of flow simultaneously on the same chart.

Write for catalog No. 20.

Brown Electric Flow Meters, designed to measure high or low pressure steam, water, air or gas, are built in indicating, recording, signaling, controlling and integrating models. Recorders, circular- or strip-chart. Manometers operate on one or two ranges of pressures. Strip chart recorders record from 1 to 12 points. Instant reading from any point by turning switch. Indicator and recorder can be interconnected to operate simultaneously from same manometer. Can be practically any distance from manometer. Indicator can be at one point, recorder at another. System ideally flexible.



"To Measure is to Economize"—*Pascal*

The New **Brown Electric Flow**
on the Inductance Bridge Principle

The Brown Instrument Company
Wayne & Windrim Avenues
Philadelphia, Pa.

Please send me a copy of your catalog No. 20 describing the new BROWN ELECTRIC FLOW METER operating on the inductance bridge principle.

Name_____

Title_____

Company_____

Address_____

Lots of money paid for steam goes up the stack — *Does Yours?*

ONLY the heat that gets *into a boiler* counts for steam economy. Heat is carried to boilers by hot gases. If boiler tubes are clean, the heat passes readily through them into the boiler. The gases, cooled, pass on through the flue and up the stack.

But if tubes are dirty—are covered with soot outside and scale inside, as they will be unless cleaned often—much of the heat that would otherwise make steam is lost up the stack. Fuel is wasted to heat all outdoors.

PYROMETERS DETECT THESE LOSSES

With indicating or recording pyrometers the operator can tell at a glance whether the flue gases have given up as much heat as they should.

If too hot he decides if the trouble is due to dirty tubes, or to an excess of cold air entering the furnace, and corrects the cause of fuel waste.

The accuracy and reliability of BROWN ELECTRIC PYROMETERS is demonstrated by their service in many prominent power plants.

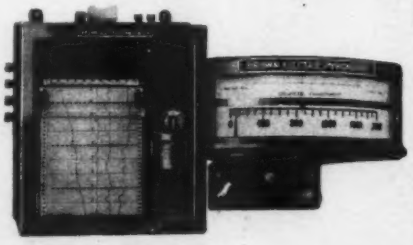
Write for complete details of the many applications of these money-saving instruments.

Ask for Catalog No. 15.

THE BROWN INSTRUMENT COMPANY
Wayne and Windrim Avenues, Philadelphia, Pa.

DISTRICT OFFICES

New York, Boston, Pittsburgh, Buffalo, Cleveland, Detroit, Chicago, Indianapolis, Birmingham, St. Louis, Tulsa, Houston, El Paso, Los Angeles, San Francisco, Denver, Salt Lake City, Montreal.



ASIDE from their power plant service Brown Pyrometers are used in connection with the operation of many industrial processes in which close temperature observation and control is vital. Temperatures may range from 400° F. to 3000° F. These instruments are built in indicating, recording, signaling and controlling models. Recorders may be circular-chart or strip-chart type. Strip-chart recorders may be single-record or designed to produce on a single chart up to 12 simultaneous records.

"To Measure is to Economize"—*Pascal*

The Brown Instrument Company,
Wayne & Windrim Avenues,
Philadelphia, Pa.

Please send me a copy of your Catalog No. 15 showing features of BROWN ELECTRIC PYROMETERS.

Name .....

Title .....

Company .....

Address .....

BROWN PYROMETERS
Most used in the world

Corrosion of Pressure Still Equipment

By GUSTAV EGLOFF and JACQUES C. MORRELL

THE corrosion of refinery equipment, particularly pressure stills used in cracking oil, is a problem of signal importance in the refining industry owing to the high cost of replacement and ever present fire hazards. The economic loss to the oil industry due to corrosion of pressure stills runs into millions of dollars a year. The corrosion of pressure still equipment is due to the products of the cracking reaction, principally hydrogen sulphide, resulting from the chemical conversion of the sulphur compounds present in the charging stock.

It would appear obvious that the simplest method of handling this problem is to desulphurize the oil before subjecting it to cracking conditions. Relatively vast sums of money have been expended in the endeavor to desulphurize petroleum oils inexpensively. Over 40 years of intensive research have passed in an endeavor to work out a cheap method of desulphurizing high sulphur-content crude oils.

Even though the oils were partially desulphurized, experiments have shown that the remaining sulphur under cracking conditions will cause corrosion. There is no definite relationship between the amount of sulphur present in the oil and the hydrogen sulphide formed. In like manner there is no definite relationship between the amount of sulphur present in the oil and the rate of corrosion.

In a relatively short time there will be over 100,000 barrels per day of high sulphur-content oil cracked on the Pacific Coast. On the basis of an average cracking stock containing 2 per cent by weight of the oil as sulphur there will be approximately 650,000 pounds of sulphur in the 100,000 barrels of California cracking stock. To remove this amount of sulphur by chemical means, such as the copper oxide desulphurization process of Frasch, would necessitate approximately 2,000,000 pounds of copper oxide per day, and it is known that copper oxide will not react with all the sulphur compounds present in California oils.

Assuming that it were practical to desulphurize the cracking stock in California from a chemical viewpoint, the loss of oil which would result owing to the reaction would be so high that it would be an uneconomic proposition.

In view of the wide use of the cracking process at the present time, and the economic necessity of utilizing heavy charging stocks of high sulphur content, such as are being produced in large quantities in California and Mexico, it would appear that desulphurization of these oils before cracking apparently is not a practical and feasible method of attacking the problem, although work towards the ideal should be continued.

As a result, by sheer necessity we are forced to build equipment and provide means of combating corrosion due to the sulphur compounds in the cracking stock, so that it can be cracked commercially into gasoline without the need of any pre-treatment whatsoever.

The chief sources of corrosion in refinery practice are hydrochloric acid resulting from the hydrolysis at elevated temperatures of calcium and magnesium chlorides present in emulsified water in the crude oil undergoing treatment; and as previously stated, sulphur compounds, hydrogen sulphide being the only compound of sulphur known definitely to cause corrosion.

The methods of attack in preventing corrosion for these two sources must of course be considered separately. In regard to the corrosion due to hydrochloric acid the problem is quite simple. Corrosion from this source occurs only in those parts of the system where condensation takes place, namely, in the vapor lines from the dephlegmator and the condenser and receiver. Hence simple neutralization by alkaline solutions, preferably ammonium hydroxide or by ammonia will remedy this type of corrosion.

Electrolytic corrosion is exhibited at times in the condenser system on the face of the flanges, on the tubes and on gaskets. For example, where the gasket is of aluminum and the tubes of steel, the gasket being the cathode, will dissolve. On the other hand, where the gasket is of copper the face or flange of the steel tube will dissolve, the latter being the cathode. Hence the solution of this problem is to find a gasket which is unaffected by internal corrosion due to vapors, and of low electromotive potential difference between the gasket and the tube.

Corrosion owing to the presence of sulphur compounds results for the most part in a system where the oil is being cracked. Decomposition of sulphur compounds under ordinary distillation conditions also occurs to some extent. The greatest corrosion may be expected usually in oils of higher sulphur content than 0.5 per cent. As stated previously there is no exact relationship between the sulphur content and the degree of corrosion.

The lines of attack in solving corrosion problems will follow under the general classification of either the chemical or the metallurgical method of protection. This classification is for convenience only. The former has to do with the introduction of chemicals into the system to remove or neutralize the corrosive substances, while the latter deals with the use of special metals or alloys to prevent corrosion or the use of metal liners to control corrosion by easy replacement of parts.

Sources of Corrosion

So far as is known today, the principal source of corrosion in the cracking of oil is hydrogen sulphide. The formation of hydrogen sulphide is possible from a great number of sulphur derivatives of the hydrocarbons present in petroleum oils.

Experimental data has shown that the extent to which corrosion takes place is not a function of the sulphur content of the oil, as is illustrated by Panhandle crude containing 0.6 per cent sulphur, which shows very marked corrosion, and Smackover crude, which contains 2.8 sulphur, exhibiting very little corrosion. This is a very important point to observe in connection with the problem of corrosion and it cannot a priori be stated that an oil of high sulphur content will show a corresponding corrosion rate.

It has been observed by the writers that corrosion may be due to elementary sulphur, particularly in those portions of the system where the sulphur has condensed and is in a molten state, for example, on the walls of the reaction chamber or of the vapor lines. There is evidence apparently that elementary sulphur also corrodes the reaction chamber below the liquid level line maintained therein. Experiments have indicated that elementary sulphur will react with steel at various temperatures corresponding to the different parts of the cracking system, down to that of the vapor line leading to the condenser.

Crystals of ferrous and ferric sulphate found on the pans and the walls of the dephlegmator in cracking systems indicate that sulphuric acid is also present in the cracking system during the reaction. The formation of sulphuric acid is quite difficult to explain in view of the highly reducing atmosphere which prevails in cracking systems.

Very little experimental work has been done to determine the influence upon corrosion of oxygenated com-

*Read before the meeting of the American Institute of Mining and Metallurgical Engineers, New York, February 16, 1927.

pounds such as naphthenic acids in petroleum undergoing cracking, and their influence in the formation of possible oxidized sulphur compounds and organic acid bodies. There is also the possibility of the formation of oxidized nitrogen compounds, but so far there is no evidence as to the presence of nitrous acid or the corresponding oxides.

There has been no experimental work as yet to indicate to what extent corrosion takes place, owing to water present in the oil. The reaction between steam and iron is well-known, but here again it is difficult to explain why such oxidation of iron by steam should take place in a reducing atmosphere, unless obsorption effects enter in. Further there is the possibility of the well-known rusting phenomenon which occurs when oil is exposed to the simultaneous action of water and oxygen.

Resistance of Various Metals to Corrosion

In a test covering a period of approximately 20 days, while cracking 17,000 barrels of California oil, containing one per cent sulphur, at a temperature of 860 degrees F., the following metals suspended in the vapor zone of the reaction chamber showed a loss in weight as indicated in the table:

Metal Sample	Loss Weight Grs. Per Sq. In. Surface Exposed
Aluminum	0.004
Duraloy	0.010
Endure	0.010
Ascolov	0.046
Rezistall No. 4	0.064
Rezistall No. 8	0.077
Atha No. 2600	0.175
Armco Iron	1.11
Steel	1.19
Copper Bearing Steel	1.65
Calorizing "C"	2.39
Monel Metal	3.85
Copper	Entirely reacted upon

Wilson and Bahlke[1] in an important paper on "Special Corrosion Problems in Oil Refining," report on tests of metals and alloys in pressure stills using a cracking stock containing 0.25 to 0.30 per cent sulphur. They give the following comparative corrosion values of various strips of metals suspended in the upper part of the cracking still, under a temperature of 735 degrees F.

Metal	Loss Mg./sq.cw/run.	No. of Runs
Aluminum	None	60
Calite casting	None	60
Calorized plate	None	50
Duralumin	None	10
Stainless steel (Firth-Sttrling)	0.03	33
Ascoloy	0.03	94
Aluminum bronze	0.11	38
Galvanized iron	0.55	50
Zinc	0.60	10
Cast iron	2.73	30
Vismera steel	2.96	10
Special Climax alloy steel	3.32	33
Still-bottom steel	3.44	30
Copper-bearing steel	3.49	10
Low chromium alloy steel	3.68	20
Wrought iron	3.69	10
Monel	3.85	10
Bronze	19.25	10
Brass	21.8	10
Copper	40.6	10

[1]Ind. and Eng. Chem. 17, 357, 1925.

The Corrosion of Various Parts of Pressure Still Equipment

The corrosion of pressure still equipment takes place principally in the heating tubes, return bends, plugs, pipe connections in hot oil pumps, hot oil pumps and pyrometer well in what is primarily the liquid zone, and in the vapor lines, reaction chamber, dephlegmator, and pyrometer wells in the liquid-vapor and vapor zones.

The heating tubes used in pressure still equipment are usually fabricated from mild steel of seamless type. With cracking stocks showing high rates of corrosion the steel tubes corrode relatively rapidly calling for frequent replacements. The life of mild steel tubes subjected to the highest temperature conditions of cracking is about two months with a cracking stock containing one per cent sulphur. Experiments show that an approximately 15 per cent chrome iron tube will cut down the corrosion rate to a remarkable extent. Chrome iron tubes which have been in service for a period of seven months under similar cracking conditions to the mild steel tubes, show no marked corrosion up to the present, and are still in service. The mild steel tubes under similar conditions had a maximum life of two months.

Reports upon calorized tubes apparently are inconsistent, in that under certain conditions the tubes stand up quite well, whereas they deteriorate under other corrosive conditions about as rapidly as ordinary steel tubes. The calorized tubes apparently are successful when using a heavy wall thickness for the tubes, but there is still a wide variation of opinion as to the beneficial results of using them. One company reports highly satisfcatory results; another that calorized tubes were used for 50 cracking cycles, while calorized tubes in other cracking units failed after seven days under similar conditions. The use of calorized tubes should not be discouraged until further tests have been carried out, and likewise the manufacturers should produce uniform products which will operate over long periods of time consistently.

The corrosion factor in connection with return bends of mild steel has been shown to be high under conditions where other parts of the system undergoes corrosion, but the difficulty can be overcome by the use of special alloys such as chrome iron, chrome nickel iron, and chromium plating. Tests are being conducted on calorized return bends which show some promise of success.

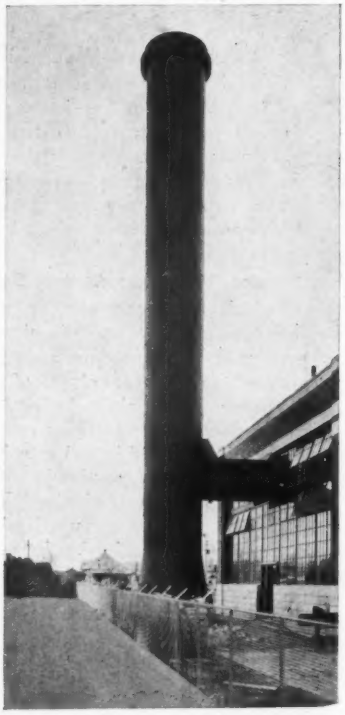
In the use of plugs to seal up the tubular portion of the cracking system, the use of chrome iron introduces an additional problem owing to the fact that chrome iron has tendency to "freeze" so that it is difficult to remove the plugs from the return bends. This is due to the small difference in the coefficient of expansion of the material of which the plugs are made compared to the return bends. Plugs such as aluminum bronze and Monel metal, having greater differences in coefficients of expansion show a greater tendency to corrode than chrome iron, although the use of Monel metal has been reported upon favorably in some plants.

Chromium plating has been tried with plugs and has given excellent service. In this connection the chief question apparently is the care with which the plating has been done. Another factor to be considered is the difference in coefficient of expansion between the chromium plate and the metal base. This difference must be small or peeling will take place. The use of chrome nickel iron plugs has given good results from a corrosive standpoint and non freeze condition.

The use of pyrometer wells in pressure still equipment is important for if not made of the proper material they corrode rapidly. To overcome this condition various alloys have been used, chrome iron being the most satisfactory from a corrosion resisting standpoint. Here again, owing to the slight difference in the coefficient of expansion compared to the material into which the well is threaded "freezing" takes place. The chromium plating of proper expansion coefficient alloys apparently a satisfactory solution to the corrosion problem for pyrometer wells.

Reaction Chamber

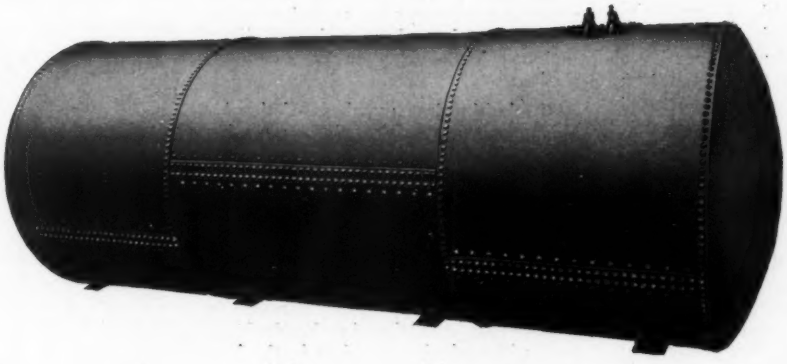
The reaction chamber due to its size and high cost of replacement is the critical point in pressure still equipment where corrosion must be kept down to a minimum. This is owing to the large diameter of the chamber which under bursting conditions can become highly destructive. It has been estimated that in some pressure still equipment the reaction chamber without any protective measures, corrodes away at the rate of one-sixteenth of an inch per month, hence to overcome the corroding effect it has been proposed to make the wall chamber thickness



Steel Smoke Stacks

We fabricate and erect large steel smoke stacks anywhere in the Southwest. Our equipment and erecting crews represent the acme of experience and efficiency. We are prepared to submit bids for either self-supporting or guyed steel smoke stacks built and erected to our specifications or to customers' plans.

Pressure Tanks



We are prepared to furnish promptly from plate in our warehouse riveted or welded tanks of all sizes for any pressure up to 350 pounds.

Wyatt Metal & Boiler Works

DALLAS, TEXAS

great enough to take care of this rate of corrosion. This is merely a makeshift to the answer of the problem of corrosion in reaction chambers, as corrosion is just as likely to cause pitting as to bring about the uniform removal of metal. The corrosion reaction at times is selective in pressure stills, hence adding to the danger unless discovered in time.

An acceptable method of handling the corrosion problem is to actually line the reaction chamber with boiler or chrome-iron plates, by spot welding them to the chamber, or rolling in snugly a thin liner of chrome iron. The use of boiler plates is predicated on the idea of controlling the corrosion by virtue of ease of replacement of the parts which have been corroded or would corrode. On the other hand the use of metals like chrome iron which corrodes with difficulty, while more expensive to begin with, have the advantage of offsetting corrosion.

The lining of the reaction chamber with aluminum has been proposed but has not been found satisfactory in tests due to its relatively low softening point and its high coefficient of expansion which would produce a creep effect under service conditions.

Another method of preventing corrosion of reaction chambers is to electro-plate with metals such as chromium, which has given good results.

Spraying metals with a gun while looked upon as the equivalent of plating has not given satisfactory results so far. Aluminum, which is one of the metals most resistant to corrosion in the cracking operation, has been tried without any special success. This is probably due to the lack of perfect adhesion between the metal coating and the body of the still as the corrosion appears to take place beneath the coating at points where the latter does not show uniform texture. Spraying the reaction chamber walls with chromium has not yet been accomplished because of the very high melting point of chromium. The indications are that although one may be able to spray chromium, it may not be satisfactory for the same reason that aluminum has proven to be unsatisfactory. Some preliminary experiments indicate that heat treatment after metal spraying gives improved results.

The reaction chamber may also be coated with chemically resisting material such as water glass, graphite and other substances, but so far no definite commercial results have been obtained.

The construction of the whole chamber of chrome iron offers many technical difficulties which have not been worked out as yet, and further there is to be considered the high cost of chrome iron compared to the other methods of resisting corrosion that are apparently satisfactory.

The Vapor Line From Reaction Chamber to the Dephlegmator

The vapor line is a sensitive element of pressure still equipment under corrosive conditions. One of the methods of overcoming the effects of corrosion here is to determine the life of the vapor line and replace it at regular intervals before the danger point of rupture. Another method is to fabricate it from corrosive resisting material such as chrome iron. Plating of the vapor line with chromium would be effective in cutting down corrosion.

The type of bend in the vapor lines affects the rate of corrosion at these points, no doubt due to the influence of velocity of the vapors upon the rate of reaction. This has also been observed in the dephlegmator where the vapors enter same. Corrosion has been observed to be marked opposite the points of entrance. This is overcome by inserting a baffle plate at right angles to the path of the vapors.

Dephlegmator

The dephlegmator in cracking equipment is operated under lower temperature conditions than those prevailing in the heating tubes or reaction chamber hence the corrosion is somewhat modified. While corrosion takes place at a modified rate here it is sometimes necessary to overcome same by means of a liner of steel or resistant alloys such as chrome iron or by chromium plating.

The baffle plate members of the dephlegmator are subjected to corrosive action which can be readily overcome by the use of aluminum or aluminum alloys or chrome alloys. In the event of injection of caustic soda or other alkalies into the dephlegmator to counteract the corrosive action of the vapors, aluminum should not be used due to its reactivity with these reagents. In general, corrosion in the dephlegmator is markedly less than in the hotter portions of the system and the precautions cited readily solve the problem.

The Reflux Conduit

The hot reflux liquid passing down from the dephlegmator causes definite corrosion to take place particularly in the regions of the vapor zone. The problem here is similar to that of the vapor line previously referred to, namely, to manufacture this pipe of such material as will resist corrosion, or to electro-plate with chromium.

The reflux pump shows evidence of corrosion, particularly on the portions which come in direct contact with the hot oil. This would include the balls and check valves and makes it desirable in some cases to use special liners and special alloy parts.

Condenser and Vapor Line

Corrosion becomes decreasingly marked from the vapor line to the condenser coil and pressure distillate receiving drum, and except for the hydrochloric acid corrosion previously referred to, usually gives no great trouble in these cooler portions of the system.

Chemical Protection Against Corrosion

To overcome corrosion in pressure still equipment various chemicals have been used. These consist mainly of the alkalies, such as solutions of sodium hydroxide, ammonium hydroxide and suspensions of lime. These correctives are usually injected into the dephlegmator and beneficial results in offsetting corrosion have been obtained by their use. The solutions are usually injected into the system preferably by means of direct acting pumps, but blow cases may be used.

The results so far indicate that corrosion is cut down fifty per cent or more by the use of relatively small amounts of caustic soda solution compared with the quantities required to neutralize all of the hydrogen sulphide present in the gas. Calculations show that less than ten per cent of the amount of caustic necessary to neutralize the hydrogen sulphide will give the above result. The use of caustic soda is now a commercial means of cutting down corrosion.

Ammonia is used in relatively small amounts mainly due to its cost. Further the ammonium sulphide formed is unstable in the hotter portions of the system. Ammonia is used primarily for the neutralization of hydrochloric acid. The manner of introducing it is similar to that of caustic soda.

Lime is used in commercial pressure still operations for the purpose of cutting down corrosion and should be effective in a similar manner to caustic soda although not as easy to handle. The hydrated lime is agitated with the charging oil, the amount used depending upon the charging stock, and pumped into the system in a continuous manner.

However, so far the use of chemical agents is not a panacea for corrosion. They have the advantage of offsetting corrosion to a marked degree even when using only a small percentage of the amounts of material required for complete reaction with the hydrogen sulphide formed. Otherwise their cost would be prohibited.

Summary

1. The economic importance of the solution of the corrosion problem has been shown.

2. The causes of corrosion in pres-

Buyers' Guide Issue

The May issue of THE REFINER AND NATURAL GASOLINE MANUFACTURER will be the Annual Buyers' Guide Issue.

It will contain the names and addresses of the manufacturers of practically every type of equipment used in the refining and natural gasoline business.

These products will be cross-indexed in such a way as to make it a very handy reference book.

This Buyers' Guide Issue is a part of your subscription price—an extra effort to make THE REFINER AND NATURAL GASOLINE MANUFACTURER more valuable to you.

PRESERVE IT!

sure still equipment have been discussed.

3. Several solutions of the problem now actually in commercial use have been indicated.

4. The use of special alloys such as chrome iron, chrome nickel iron and like corrosion resisting alloys have given good results in actual use.

5. Elecro-plating with corrosion resisting metals such as chromium has proven satisfactory.

6. The use of spray-gun plating calls for further investigation.

7. The results of calorizing have so far been variable.

8. Metallic liners of corrosion resisting metals and other metals which can be easily replaced have been used with good results.

9. The use of chemical reagents such as the alkalies has been described, and corrosion has been considerably reduced thereby.

10. Desulphurization of cracking stocks has so far been found to be uneconomic.

Oklahoma Refiners Enter Protest of Rates Proposed In I. C. C. Order

Tulsa, Okla.—Nine Oklahoma refining concerns have begun action, looking to the prevention of the establishment of the new rail rate differential, ordered by the Interstate Commerce Commission, giving Group Two (Kansas), a differential over Group Three (Oklahoma).

While the plan of action has not been decided, indications are that an injunction will be sought in federal court, preventing the establishment of the new rate differential, which is due to take effect May 20.

Several carriers serving the Northeastern Oklahoma refining district are to be enlisted in behalf of the Oklahoma refiners. Conferences with officials of these railroads began in St. Louis April 1. The decision at this conference will determine what action the Oklahoma refiners will take.

So far as the matter has been outlined, the effort will consist of an effort to have the old Group Two, a small section of Northeastern Oklahoma, put on a rate parity with that part of Kansas north from Arkansas City and including Wichita.

The distance from this part of Oklahoma to St. Louis is but little different from the Arkansas City-Wichita section of Kansas. A few of the Oklahoma points are closer than some of the Kansas points.

The Oklahoma refiners linked for this effort are the Bransdall Refining Company, plant at Barnsdall; Shaffer Oil and Refining Company, plant at Cushing; Producers and Refiners Corporation, plant at West Tulsa; Empire Refineries, Inc., plants at Ponca City, Cushing and Okmulgee; Independent Oil and Gas Company, plant at Okmulgee; Mid-Continent Petroleum Corporation, plant at West Tulsa; Tidal Refining Company, plant at Drumright; Transcontinental Oil Company, plant at Bristow and Boynton; Marland Refining Company, plant at Ponca City.

The district embracing these refining points is about that designated by Group Three, when petroleum rates were first made. At one time Arkansas City, Kan., was included in Group Three, with Oklahoma refining points, leaving Eastern Kansas as Group Two.

As the refining districts of the two States enlarged, the eastern half of Kansas came into Group Two, while the greater part of Oklahoma came into Group Three.

The recent I. C. C. decision, giving Kansas an increased differential over Oklahoma, came following several hearings. Oklahoma refiners sought to have the body reopen the case through petition. All these efforts have failed, so the next move seems to be the courts, through an injunction.

The committee steering the matter for the Oklahoma refiners is J. C. Denton, vice president of the Mid-Continent Petroleum Corporation; W. C. Franklin, vice president of the Tidal Refining Company, and A. C. Holmes, traffic manager of the Empire Refineries, Inc.

Analysis of Nigger Creek, Texas Crude Petroleum

Washington, D. C.—The crude petroleum being produced in the Nigger Creek field of Limestone County, Texas, appears to be a typical intermediate base crude, according to an analysis of a sample, recently made by the Bureau of Mines, Department of Commerce. The crude oil has a gravity of 40 degrees A.P.I. and contains about one-fourth of one per cent of sulphur. It flows easily and has a brownish green color by reflected light. The crude is shown by the Bureau of Mines method of analysis and interpretation to contain about 37 per cent of gasoline of 62-63 A. P. I. gravity and about 12 per cent of 44 gravity kerosene. The presence of lubricating stocks is also indicated.

The sample analyzed by the Bureau of Mines was produced from the Woodbine sand at a depth of 2840 feet. The well was producing 250 barrels of oil per day when the sample was taken. The production of the Nigger Creek field during December, 1926, was approximately 10,600 barrels per day.

The approximately summary of the analysis of this crude is as follows:

	Per cent	Sp. Gr.	A.P.I.	Viscosity
Light gasoline (end point 212°F.)	12.2	.682	76.0	
Total gasoline and naphtha	36.9	.728	62.9	
Kerosene distillate	11.5	.804	44.5	
Gas Oil	15.8	.849	35.2	
Nonviscous lubricating distillate	10.4	.867-.893	31.7-27.0	50-100
Medium lubricating distillate	6.8	.893-.917	27.0-22.8	100-200
Viscous lubricating distillate	—	—	—	Above 200
Residuum	18.6	.956	16.5	
Distillation loss	0.0	—	—	

The detailed analysis of the sample of crude is as follows:

Sample No. 26586
Texas, Nigger Creek Field, Limestone County

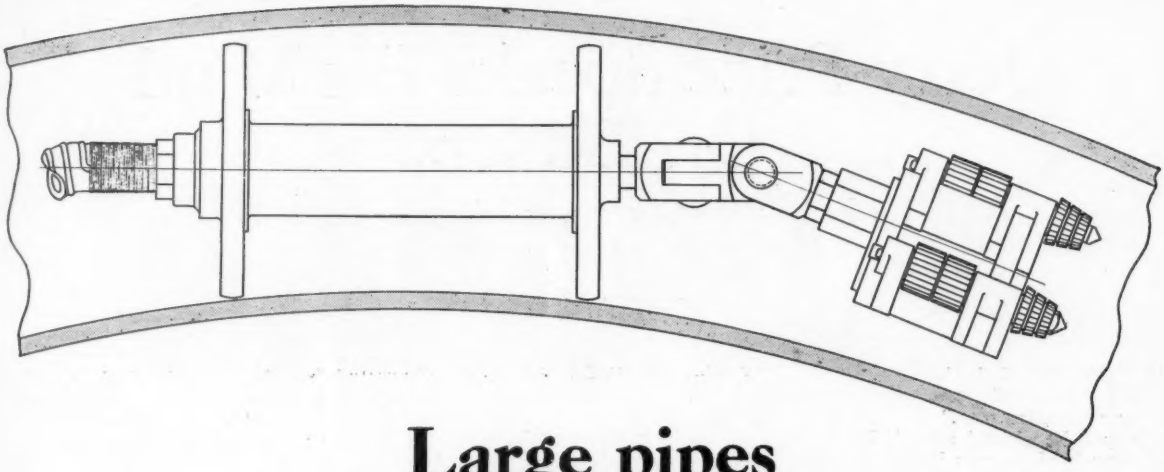
Woodbine sand — 2840-2842 Feet
Specific gravity, .825 — A.P.I. gravity, 40.0°
Per cent sulphur, .27 — Per cent water, nil.

Saybolt Universal viscosity at 70°F., 42 Sec. Pour point below 5° F.
Saybolt Universal viscosity at 100°F., 42 Sec. Color, brownish green.

DISTILLATION, BUREAU OF MINES HEMPEL METHOD

Air distillation — Barometer 749 mm. — First drop: 33°C. (91°.)

Temperature °C.	Per Cent Cut	Sum Per Cent	Sp. Gr. of Cut	A.P.I. of Cut	Viscosity at 100°F.	Cloud Test °F.	Temperature °F.
Up to 50	2.7	2.7					Up to 122
50- 75	2.1	4.8	.662	82.2			122-167
75-100	7.4	1.2	.695	82.2			167-212
125-150	5.7	17.9	.695	64.2			212-257
100-125	5.7	17.9	.723	59.2			257-302
150-175	5.8	30.9	.762	54.2			302-347
175-200	6.0	36.9	.778	50.4			347-392
200-225	5.1	42.0	.795	46.5			392-437
225-250	6.4	48.4	.812	42.8			437-482
250-275	6.3	54.7	.830	39.0			482-527
Vacuum distillation at 40 mm.							
Up to 200	4.9	4.9	.859	33.2	42	20	Up to 392
200-225	7.3	12.2	.864	32.3	48	45	392-437
225-250	5.2	17.4	.883	28.8	65	60	437-482
250- 75	4.5	21.9	.892	27.1	97	78	482-527
275-300	4.8	26.7	.909	24.2	193	92	527-572
Residuum	18.6%			Distillation loss, nil.			
Carbon residue of residum, 8.6%.				Carbon residue of crude, 1.6%			



Large pipes as well as small tubes may be Liberty cleaned

A complete tube cleaning service for Oil Refineries is furnished by the various sizes and types of Liberty Cleaners.

The illustration above is reproduced from a tracing of a TANDEMTYPE Liberty Cleaner, designed for cleaning the 8" O. D. vapor lines of a Dubbs still. It is simply representative of the work we are doing in fitting our cleaners to all sorts of tube cleaning requirements in the oil refinery.

In addition to the cleaning of the pressure still tubes themselves, we are constantly designing and furnishing cleaners for all of the different tubes and pipes of various size and curvature encountered in the different processes. Our experience with such work is of benefit to you, and we can furnish exactly the proper type of cleaner and cutting head for the particular work contemplated.

Let us work with you.

Liberty Manufacturing Co.

Jeannette, Pa.

Z-1040

Periodical cleaning of boilers, pressure stills and all tubes and pipes through which a heat transfer is accomplished, is a necessary procedure if efficiency is to be maintained. There is a Liberty Cleaner exactly suited to all such service.

Jerry Price Speaks His Mind On Boilers

It's low water and scale, which bring most of the grief, and ignorance helps.

By J. A. CRUZE

"THEY'RE the best known and least understood servants of modern man."

Jerry Price glanced around the circle of eager-faced listeners before the camp fire as though expecting a challange to his statement.

It was my party; having coaxed and cajoled for weeks until tonight I had with me a gathering of men who, although not yet well acquainted with each other, showed instant evidence of an unmistakable kindred spirit. We all loved duck hunting and boilers.

Jerry Price is one of the oldest boiler inspectors in the state; and for that reason I had used his name as well as a "cross my heart" promise of "plenty of ducks" to get two or three of the more skeptical to come along on what they prophesied would "more than likely turn out to be a goose-chase, rather than a duck hunt."

I had guaranteed to bring Jerry along and "uncork him" at the first opportunity. So now that camp was made and a wonderful first duck supper over, we ranged around the camp fire to swap yarns.

As every one showed unmistakable evidence of interest and no desire to interrupt, Jerry continued.

"It has been my good fortune to personally examine some 20 or 30 boilers after they had exploded; and several dozen others that, by all the laws of mechanics, should have caused a lot of trouble.

"Few indeed are the people who can visualize just what a boiler explosion means until they have seen one. No, not even the men who design them; not to mention the poor sap of a greenhorn fireman so frequently seen in full charge of a battery of these cargoes of concentrated dynamite.

"Few boilers ever exploded because they were not built strong enough. They would have exploded if they had been built ten times as strong; provided the fool operator had abused or neglected them the same as he does the usual boiler that explodes.

"You know it is said that man is bound to things higher by Heaven; to the uncouth and degenerate below; before him is eternal hope, and behind a path strewn with regrets.

"Thanks to my lucky star, none of the regrets trailing in my path have been caused by passing on a boiler, air-tank or any other mechanical contrivance that through my negligence, later took a human life.

Low Water or Scale

"A factor of safety is composed of two well defined parts. One part is the thorough knowledge of conditions as they should exist; while the other part is none other than ignorance.

"Just what percentage the knowledge factor in your problem represents, is the ultimate in its achievement; barring of course a hand out by 'Lady Luck.'

"Considering even such causes as poor workmanship, poor material, poor design, or caustic embrittlement, it's very rare that a boiler ever explodes from any other cause than low water or some form of scale, which as I have said before, is either neglect or abuse, or both.

Low water may cause two distinct types of explosion, although they both get the same type of results, that is, everybody within gunshot, (to quote a certain colored gentleman) is 'jes' natcherly ruined.'

"The most violent type of boiler explosion is caused by firing the boiler (usually under a heavy load) until some vital part, like the crown sheet of a locomotive is exposed to the direct action of the fire. Before the metal has been heated to the yield point, say anywhere between blue and gray colors of tempering, the water is raised enough to cool the metal suddenly. The sudden contraction causes cracks at rightangles between the points of greatest, stress, ripping the boiler wide open.

"The second type of low water explosion wherein the over heated metal is not cooled at all, but fired relentlessly on until it is hot enough to become soft and pull apart, has been known to do about as much mischief as the chilled sheet in one case and scarcely do more than scald the engineer and fireman in another.

"I saw the remains of a locomotive in 1912 that had been fired more than half empty before she let go. The watermark was easy to see, about two and a half feet below the crown sheet. The injector wasn't working right and the gauge glass was plugged in such a manner that evidently, the fireman thought he had half a glass of water. The crown sheet was heated until it became soft enough to rip off all the radial stays, that is the stay bolts pulled right out of the soft metal, then the crown sheet turned wrong side out just like a sock. The boiler was torn entirely off the frame and hurled several hundred feet from where the ash-pan was driven through the ties, which was the only way we could judge where the engine was at the exact instant of the explosion. The boiler metal was not cracked open like the usual steel fracture, but instead the edges were jagged from the stresses while hot, or the best comparison I can think of right now would be to take a piece of cardboard soaked in water, then pull it apart.

Spreading Death

"That same year another road had two of the 'chilled steel' type of explosions. One killed thirty-five men and injured forty, (at least the papers said so) while I saw the four dead from the other. The one I saw happened this way. An engine was due to go on a run in a short time. The fireman found it inside the round house, instead of on number one lead as was customary. He saw also, that although a hot fire was going, no water was in the glass. He made tracks for the office and reported what he had found, but the foreman and the hostler laughed at him. 'Just the same,' he told them, 'you get the water up, and then bring her outside if you want me to fire this run.' Fools that they were, they both climbed into the cab and each put on an injector. Then she let go, and killed a machinist and helper, working on another engine along side as well as the two dumbbells who exploded her. The cold water rushing in must have caused localized contraction of the overheated crownsheet, for it cracked like cast iron, letting out a full head of steam. Boys! If you ever saw a wreck! The engine along side was so badly messed up that they thought both of them exploded for a while. Like the first one I mentioned, the boiler was torn off the frame. It was hurled through the round house roof at an angle which brought it down over two hundred feet away on top of a storage water stand-pipe, which promptly came to earth with the boiler and started a young Johnstown flood.

"I didn't see the plant where one 70 horse-power H. R. T. boiler let go and knocked 13 others off their foundations, but a pal of mine who was detailed to help the I. A. C. man on the case, told me. He said they looked like a set of dominoes. Ever do that when you was a kid? Set dominoes on end about one length apart in a winding row all over

SAFEMCO

PAINTS

"SAFEMCO"
Every
Exposed
Surface

Our Paints Are Made
Especially for the
Southwestern Oil Industry

AMERICAN
PAINT & SUPPLY COMPANY

DALLAS, TEXAS

the table, then start the end one falling, to knock down the second one and so on until the whole line falls? Well, those 13 boilers were knocked down just that way. The one that exploded? Oh it smeared itself all over the landscape as usual, but the explosion was not caused by low water. The water at this plant was hard and the boilers were full of scale. It cost a lot of money to rattle the tubes, while the compound they used didn't do much better. So, one day a high-powered softener salesman sold the boss a perfectly good zeolite water softener. Now mind you, I'm not knocking a zeolite water softener. This one was just what the salesman had represented it to be; maybe even better. But why I say high-powered is because when that salesman had collected his commission on the sale, it was ended so far as he was concerned. The owner hadn't the slightest conception of what was in store for him when he turned the zero hardness water into his boilers with their tons of scale inside them. The soft water not only prevented the scale, but it soon loosened the old scale in sheets which slid down from the sides of the shell, as well as that which was small enough to fall between the tubes. Anyway, judging from the other boilers, this boiler must have gotten slightly ahead of the rest of the battery in the race to shed their scale. Some two or three wheel-barrow loads collected at the bottom of the shell, over the hottest part of the fire. The rest was simple. The scale kept the water off the steel so that a transfer of heat was impossible. The steel became overheated and soft, then the pressure from within did the rest.

"Either ignorance of the laws of mechanics and energy, or ignorance of responsibility, or in many cases both, are rampant in the operation of entirely too many boiler plants.

"The A. S. M. E. boiler code should not only be adopted, but it should also be rigidly enforced in each and every State in the union; and to my way of thinking the majority of the code rulings should apply to the care and operation of boilers, in addition to stressing details of construction, which are never even dreamed of by the average operator.

"Do you know the kind of questions they ask an applicant for an engineer's license in one of the largest cities in the United States? Well I'll tell you. He can pass each and every question on strength of materials, workmanship, efficiency of joints, combustion, or even show that he is a studious and competent man, with references for his years of service and just let him fail to answer a few catch questions, such as 'Why isn't a manhole round?' or if he should fail to set a Meyers Riding-cut-off valve in the allotted ten minutes, he will not get his license. But these old fossils in charge of such nonsense cannot last. People are coming to respect the competent boiler-man for more than they now do the one time 'czar engineer.' Mr. Owner now realizes that more dollars can go out of the stack, or down the ash sluice than ever can slip away in the engine room. Of course this does not apply literally to drilling rig field boilers, where fuel is not worth more than the pipe to hook it up.

"But wherever fuel is worth money the combustion engineer is coming into his own."

An Ill Wind

"Tell us about the time that fellow called you up and asked why his boilers foamed when the east wind blew," I prompted.

Jerry laughed as he kicked a chunk farther into the fire, sending up a shower of sparks into the faintly starlit darkness.

"Yes, John, that was just plain boiler foaming; one of the commonest boiler troubles in the world, but it was a sticker all right at first. He wanted me to come out to the plant the week before, but I put him off; told him his external wasn't due for 30 days and that I would get his and Miley's boilers together and save me a 50 mile trip. But early Monday morning he called me again. Said I must come right on out, and, finally, after I had held him off for a while, that's what he said. He wanted me to tell him just what the east wind had to do with making his boilers foam. So of course I had to go.

"He had a dandy hot-process (lime and soda-ash) water softener. Heated his feed-water to 210 degrees with the exhaust from a battery of pumps. His feed-water pumps were in fine condition. No oil going through to the boilers. Ph and Mo test of the treated water checked perfectly on the chart; and, in fact, things in general looked very good. The weather was perfect and as he explained to me, the boilers were not foaming, although the day before they had almost shut the plant down.

"Finally, after quizzing him from all angles on the plant in general, I asked how his engine jackets got along on raw water. He said he wasn't using raw water in the cooling system any longer, as he had talked the boss into letting him take the cooling system makeup from the boiler water softener. He drew a diagram of the piping with the new connection as it was buried in the ground, and explained how he now took soft water for the cooling system from the settling tank, while the boiler feed pumps took off directly from the sedimentation tank.

"Of course that let the cat out of the bag. Things worked splendidly as long as the weather was fair. But when the east wind blew, which was always hot and dry, the cooling towers took much more water. This shortened the time for settling in the settling tank, which in turn shortened the time for chemical reaction in the softener, and as the boiler feed pumps took directly off the softener, they pumped the incomplete products of the softening process into the boilers.

"We opened a dead boiler then to see how nearly we came to the solution, and sure enough, there it was; lime and soda-ash four inches deep in the bottom segment of the shell. We worked out a way to change the boiler feed take off without shutting down, which he did next day and the last time I saw him he said his boilers hadn't foamed since.

"I ran into another one up north last year that beat the east wind guy by a mile for a close shave and just plain dumb ignorance. This fellow had been fighting 35 grain water with compound for more than a year; what time he wasn't re-tubing, or rattling, banging and hammering, when like the case I told you of where one blew up and 13 others were knocked down, they put in a softener. I don't believe old Henry Mueller who was in charge then, had even seen an add for a water softener in a magazine; so when they started this one up the service man's advice was distinctly misunderstood. It simply couldn't register on a mind as 'sot' in its way o' thinkin' as Henry's. About all that Henry understood was that no more scale would be formed in the boiler, so he told the firemen that they would 'settle down to business and get some good long runs out of these here kittles.'

"They phoned me as soon as one of the 12 let her misery get the best of her. Just spewed soot and bricks around rather promiscuously, and believe me or not, nobody got excited. It was a strange case from more angles than one. You could scarcely call it an explosion. The shell bagged just forward of the blow off, about the size of a bushel basket and a hole maybe as large as your thumb let the water out. It put the fire out and heaved a few bricks here and yon; and to my way of thinking raised considerable commotion; but when I got there all was tranquil. Not an extra heart beat.

"They were working away, putting another boiler in its place when I drove up. Old Henry was never too busy to stop and argue, or explain. 'Jerry,' he says, 'It's them blamed low-pressure burners again. I told the boss a-plenty this morning down at the office. I sez, sez I,' and so on and on. Old Henry fairly fumed as he explained how a low-pressure gas burner would invariably burn any boiler in the world. But he never once mentioned danger as far as firing the balance of the battery was concerned.

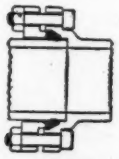
"I listedend as patiently as my nature would permit under the circumstances until Henry stopped for breath, and then I asked to see the boiler. He directed and we drove down to the salvage yard where they had taken it for patching. Henry launched into another long dissertation on gas burners in general as I knocked in a manhole, and gentlemen! I thought I had seen scale before, but that boiler took the cake. Later, they cleaned it carefully for my special benefit and no joking, they took out seven wheel-barrow loads of scale and at that it was only a 70 horse-power boiler.

"When we drove back to the plant Henry's boss was there. The first thing he said was to ask my opinion of how it all happened. Henry saw a great light about then, so before I could answer he tackled the job of laying the whole caboodle, bag and baggage, onto the new softener.

"Henry's boss evidently wasn't satisfied.

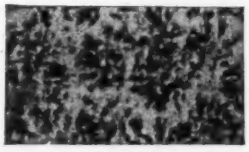
"'Price,' he said to me, 'Price, I've

SIMPLEX CAST IRON CONDENSER PIPING

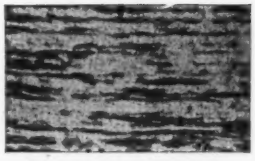


"ONE FLANGE IS LOOSE"

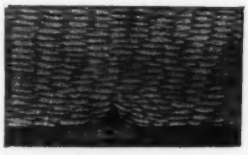
COATS ITSELF



Photomicrograph of cast iron, much enlarged, showing granular structure.



Photomicrograph of wrought iron, much enlarged, showing fibrous structure.



A piece of sheet steel, much enlarged, showing surface and sectional structure with a typical pit.

AUTHENTIC data from over 250 years of service prove that cast iron becomes coated with rust but remains practically unimpaired in weight and strength under conditions that are fatal to other kinds of metal.

Scientists believe this phenomena due to the microscopic structure of cast iron —a structure of the same granular or crystalline form as found in the iron ore from which it is made and which has laid unimpaired in the ground for untold centuries. Cast iron rusts on the surface, but the corrosive agent fails to break the natural mechanical bond between the irregular shaped granules, further oxygen is excluded by the first rust coating, and therefore corrosion stops. Cast iron literally coats itself.

In place of the interlocked grains or crystals of cast iron, wrought iron and steel are of a fibrous and, in thinly rolled steel, of a laminated structure, with distinct leaves overlapping each other. As corrosion takes place, these leaves or fibres scale off, constantly presenting a fresh surface to the corrosive agent.

Simplex pipe is flanged pipe minus the limitations of a joint made with rigid flanges. Thousands of feet of this material has been in use for years by the leading oil refineries of the United States for oil condensers.

Write for Simplex Condenser Catalog Number 55

AMERICAN CAST IRON PIPE COMPANY

General Offices and Foundry: Birmingham, Ala.

Branches at
Dallas, Kansas City, San Francisco, Los Angeles, Chicago, New York,

Write Also for information on Our Prepared Joint Cast Iron Pipe for Oil Lines

heard yon knew your groceries around boilers; what do you think?'

"Mr. Shoup," I said, "if I were you I would slow up everything to the limit if I wouldn't shut down entirely. I would fire about four boilers very lightly while I worked three shifts a day cleaning the others. Then when the others come on again I would rotate them about each week, cleaning all the scale out just as fast as the soft water turns it loose.

"'Price,' he says, 'you don't mean one of the others could burn do you?' Shoup looked grieved.

"Mr. Shoup," I said, "one of those boilers could blow up before I get these words out of my mouth.

"But they didn't. Shoup and his boss in turn had a big confab down at the main office where they decided to clean the boilers one at a time without so much lost time.

"That night they burned two more and the following morning the fourth boiler let go about like the first one before those fools would shut them down.

"Talk about dumb door-knobs! Say, where does a man get courage enough to walk up and down between two rows of boilers and fire them without hesitation until the fourth one of the lot blows bricks all around him? And all of that for a paltry six dollars for eight hours; of which any second might be his last.

"I felt like I imagine a fellow would feel if he was walking a rotten log over Hell even for the short time I was in that plant, and if they hadn't had a change of heart and put a more reliable man there in Henry's place I never would go there again.

"There's plenty of prize dumb bells running foot loose, so poor old Henry isn't alone by a whole jugfull. Take for instance that plant over at Goleta where the boiler-washer had been hosing the boiler out from the manhole, but never went inside.

"Finally, say in the course of two or three washings he had knocked off a considerable sized pile of scale by reaching as far as he could with a hammer through the manholes. Each time he would take a water hose and flush the boiler out, washing every thing back where he said he supposed it would be blown out through the blow down line.

"Then one fine morning just after the boiler was going good after a washing the fireman saw the metal was overheated and he promptly cut out the fire and ran. Again it was only a bad bulge near the blow-down connection, so they promptly called in the repair crew.

"They called me about a week later to inspect their repair job. The man who laid out the patch was there to inspect it with me and he was all puffed up with pride in the job he had done. Now I've seen the same mistake done more than once, so just a glance told me it was all wrong. Too bad you didn't call me in to help you with this Mr. Carter. I'm very sorry but I can't pass this boiler for full pressure.

"You know that fellow was as mad as a goat at me! Wanted to fight right then and there. He won't speak to me yet and says it was prejudice, put up job, and so on.

"What had he done? Why he had ruined a perfectly good and almost new boiler by laying out his shell patch too flat. Although it ran about 28 inches longitudinally he had made it but eight inches high at the flue sheet, or to make it clearer, he had cut his pressure from 130 pounds downs to 79.

"Boys, the fellow who said 'A man with a little knowledge is like a child playing with a broad-axe' knew his subject from first hand experience. Boilers have been my life work and yet, simple as most folks think they are, I find that there is much that is not known yet. Find two scientists who can agree on the subject of caustic-embrittlement and I'll bet that one of them is either bought off or crazy."

Jerry stopped short, cocked his head to one side as he held up a warning finger. We all listened obediently.

There were several short "quacks" and a distinct whirr of wings overhead as a belated part of tomorrow's quarry slid close overhead on their way to the lake.

Explosion At Parco Kills 15 Men

Parco, Wyoming.—An explosion in the refinery of the Producers and Refiners Corporation here the night of April 6, killed 15 men and seriously injured eight others. Two high pressure stills were wrecked.

The shift of 23 men was working in front of two oil process storage tanks which were fired by the exploding stills. When the tanks exploded oil was thrown in all directions, covering the workmen.

The blast was terrific and threw several people from their beds. The electric lighting system was put out of order by the explosion and darkness throughout the plant added to the confusion.

Workmen as far away as 200 feet from the explosion were injured.

Three hours were required to get the fire under control.

Property loss was estimated at about a half million dollars.

Moving West Texas Oil To Refineries

Houston.—One of the outstanding demands for West Texas crude is seen in the announcement of the Southern Pipe Line Company, subsidiary of Standard of Indiana, that 50,000 barrels daily of West Texas crude was desired, and that this crude would be used at Pan-American's refinery at Destrehan, La. The Southern has a 72-car loading rack at McCamey, with a gathering system connected with the producing fields in Upton and Crane Counties, and also a 72-car rack nearing completion at Wickett, Ward County. The latter rack has a combination six and eight-inch line connecting with the Hendricks field, Winkler County, involving about 17 miles of line. Southern Pipe Line Company has been recently considering the building of a 10-inch line from the Hendricks pool to tide water.

Humble has started operating its skimming plant at McCamey, which was moved from Hearne, and is now handling approximately 8000 barrels of West Texas crude through the plant daily. Humble's new 10-inch line to be built from McCamey refinery site, section 65, block 35, Upton County, to Ingleside, near Corpus Christi, will have a 40,000 barrel daily capacity. Crude moved through this line will be scheduled for tanker shipment to refineries on the Atlantic Coast.

Color of Lubricating Oils in Acid Stage

(Continued from page 60)

that have been acid treated and neutralized only, and are *not* further purified by filtration. As all refiners maintain definite specifications on their finished products, it is advantageous for the treater handling the batch to know whether or not the particular batch being treated, after the application of the acid, is of such color as will produce, *after neutralization*, an oil meeting the proper color specifications for that particular grade of treated oil as marketed by that refiner.

The data shown in the following table were obtained and thereafter studied in order to determine the relation, if any, between the color of a lubricating oil after the acid treatment and before neutralizing and the color after the oil has been neutralized and finished; also, to note the relation between the color of the untreated oil as charged to the agitator and the amount of acid required to produce a specification color on the finished oil.

Samples were taken from the agitators during the treatment of 54 batches of different grade of oil. Samples taken on each batch were as follows:

1. Untreated oil.
2. Oil in acid stage.
3. Finished, treated and neutralized oil.

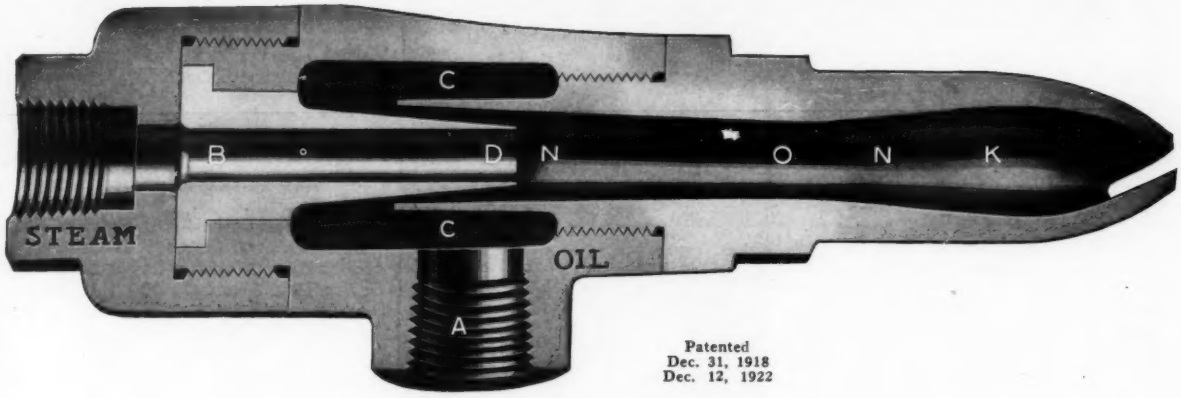
All samples were then tested for color. *Colors were taken on the samples of oil in the acid stage after having been neutralized in the laboratory with ammonia. When necessary such neutralized samples were brightened by heating before taking the color.*

Table I shows the data obtained as to the color of the different batches during the various stages of refinement, together with the amount of acid used in treating each batch of oil.

In this table it is to be noted that in nearly all cases the finished oil was darker in color than the oil immediately after drawing off the final sludge. This darkening is evidently due to the oxidizing effect of the air and to the re-dissolving in the oil of particles of sludge removed from the oil by the action of the acid, but which particles did not previously settle and hence were not withdrawn from the agitation.

The entire data in Table I is given primarily with the thought that it may be suggestive to refinery operating men the fact that they should "check-up" the efficiency of their acid treatment of lubricating oils and thus reduce to a minimum the amount of acid necessary for use in getting a definite color on the finished oil.

National Airoil Burners



Patented
Dec. 31, 1918
Dec. 12, 1922

For Power Plants and Stills

NATIONAL AIROIL BURNERS are internal atomizing burners—inside mixers—operating with either steam or compressed air; and burn as steady as a gas flame with any grade of fuel. Set your fire the way you want it, and it will burn the day through without watching or readjusting.

No smoke.

No carbon deposit.

No flare-back or back fire.

No clogging. The oil is mixed with steam inside the burner before being fed into the furnace, and cannot clog.

NATIONAL AIROIL BURNERS will handle the heavy residuum from cracking stills without requiring continual removal for cleaning, an immense factor in economical plant operation.

NATIONAL AIROIL BURNERS require less excess air, and obtain maximum efficiency because of the thorough atomization of the oil inside the burner before it is fed into the fire.

NATIONAL AIROIL BURNERS give a soft gaseous flame that does not injure brick work or boiler tubes. Made with flat or round tips.

Write for our Bulletin No. 21

National Airoil Burner Company

S. W. Cor. 9th and Thompson Sts., Philadelphia, Pa.

Oil Burners and Oil Burning Equipment

DEALING IN PERSONALITIES

George A. Sonricker

George A. Sonricker is one of the progressive old-timers in the business of refining crude petroleum. The only reason we call him an "old-timer," in spite of the youthful appearance of George in the accompanying photograph, is because he was born in the refinery yard of the Fidelity Refining Company at Clarendon, Pa., on May 13, 1887, and has never since been "out of sight" of a refining plant. At that time Sonricker, Senior, was superintendent of the refinery mentioned. At the age of three young George was moved by his parents to Petrolia, Butler County, Pennsylvania, where his father engaged in the refining business for himself. There the boys were raised—two of them, one of whom is now with the Transcontinental at Fort Worth. All of George's spare time was spent in the refinery and at the age of ten he was able to run stills, to filter vaseline, and was good at the highly secret business of "treating oil." Time was, in those days, when George carried a little box around the pump-house with him, upon which he stood when the steam valves needed opening or closing to start or stop the pumps.

Working in the refinery in spare hours during early schooling of grade and high schools, he then spent three years studying chemistry, especially the chemistry of petroleum and its products, at the Findlay School of Chemistry, Findlay, Ohio.

The first job away from home was in 1906, when George went with the Canfield Oil Company as filter house man, at this company's plant at Coraoplis. A couple of years later another connection followed with the Lake Carriers Oil Company as wax house engineer—the refinery being in the same city. Two or three refineries did not supply sufficient general experience to satisfy the ambitious young George, so for the next few years he worked in various capacities with a number of plants up and down Oil Creek and near Oil City.

GEORGE A. SONRICKER

The call of the West came in 1911, and G. A. went to the Robinson Refining Company, Robinson, Ill., as one who had conquered the mysteries of oil treating. A few months later he took charge of the paraffin works of the Kansas City Refining Company, Kansas City, Kan. In 1914 he accepted the superintendency of the Wichita Valley Refining Company's plant at Iowa Park, Texas. The plant was under construction and designed as a 500 barrel unit. During the next four years under George's guiding hand it developed into a 4000 barrel plant and paid fat dividends to the owners. In 1918 he assisted in the formation of the Lone Star Refining Company, Wichita Falls, Texas, and acted in the capacity of vice president and general manager, designing and building a 3500 barrel plant, which was later sold to Frank Brown of Kansas City. Next the plant of the Greybury Oil Company at San Antonio was rebuilt and enlarged, but the temptation of El Dorado, Ark., could not be resisted. The boom was too much, so George went over to see what it was all about. He constructed a plant in Arkansas, satisfying his curiosity, and decided the climate was not to his liking. It looks as though the call of the "wide open spaces" was insistent, for he returned to Texas as superintendent of plant for the Texhoma Oil and Refining Company at Wichita Falls.

George has a hobby. It has been his pet diversion since the days of crawling on boxes to open valves 'way back in Pennsylvania, and he insists upon securing, by cracking or by methods fair or else, more gallons of gasoline from each barrel of crude oil. He was employed by the Gilmer Oil Company, Ringling, Okla., about two years ago to operate the plant and investigate a special process for refining petroleum, which work is coming along nicely, and at the present time a cracking plant patent is pending, and the scheme looks mighty good. And the man who works for, or with, George, by the way, has a "boss" who's hard to beat.

H. G. FOWLER

H. G. Fowler of San Francisco, assistant manager of manufacturing for the Associated Oil Company, who has taken a prominent place among students of refinery efficiency on the West Coast of North America. Because he is a keen student of fact and theory of a highly technical branch of engineering, Fowler's word on a given subject would always be accepted as authority,—if he weren't such a golf enthusiast.

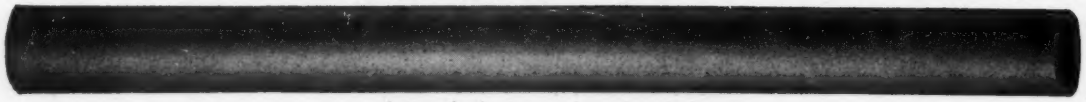
H. A. Gehres

H. A. Gehres, chief engineer of the C. and G. Cooper Company, Mt. Vernon, Ohio, was elected a director of the company at the annual stockholders meeting held at the home office at Mt. Vernon, Ohio, recently.

Mr. Gehres is a graduate of the Engineering College at the Ohio State University of the class of 1907. Since then he has had wide engineering experience, most of which has been as designer of internal combustion engines.

After spending a year with the In-

H. A. GEHRES



Pittsburgh Seamless Tubes Withstand Severe Service

The greater strength and durability of Pittsburgh Seamless Steel Tubes is especially advantageous in the oil industry because of the severe conditions encountered. The recognition of "Pittsburgh Seamless" quality is reflected in increasing our brand in both the production and refining branches of the industry.

Pittsburgh Seamless Boiler Tubes and Still Tubes

are proving eminently satisfactory to refiners. They are made by piercing solid billets of basic open hearth steel, and a high standard of quality and inspection is maintained. We also make seamless steel casing up to 12½ inches in diameter, and drill pipe of extraordinary strength. We shall appreciate your inquiries.

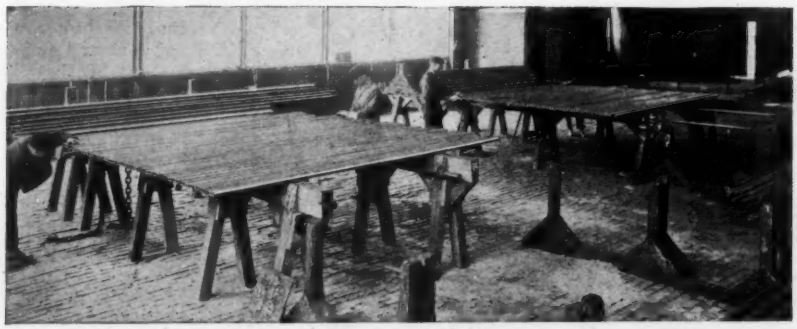
Pittsburgh Steel Products Co.

Pittsburgh, Pa.

New York — Second Nat'l Bank Bldg., Houston, Texas

Detroit

Chicago — Atlas Life Bldg., Tulsa, Okla.



Inspecting Tubes

diana Steel Company, he went to Bethlehem Steel, where he had a valuable experience in their gas engine department. He joined the Cooper organization in 1910, when Martin Thiel was in charge of engineering. At Mr. Thiel's death in 1920, Mr. Gehres was made chief engineer. He has not only carried through to successful completion many of the designs which Mr. Thiel had already started, but he has developed several new sizes of gas oil engines which today are bringing his company the greater share of its business. His influence as a designer has affected gas engine and compressor design generally. He developed the simple drag crank layshaft drive which is pretty generally used today on the more successful gas engines. He also pioneered and successfully demonstrated the removable liner contruction for compressor cylinders. Numerous other refinements in mixing valve construction and ignition systems are credited to his initiative.

His new position will not only be an aid to further engineering success but unlike many designers, his well-balanced judgment and business experience will make him a valuable addition to the management of the C. and G. Cooper Company.

Novel Dryer Used For Filter Clay

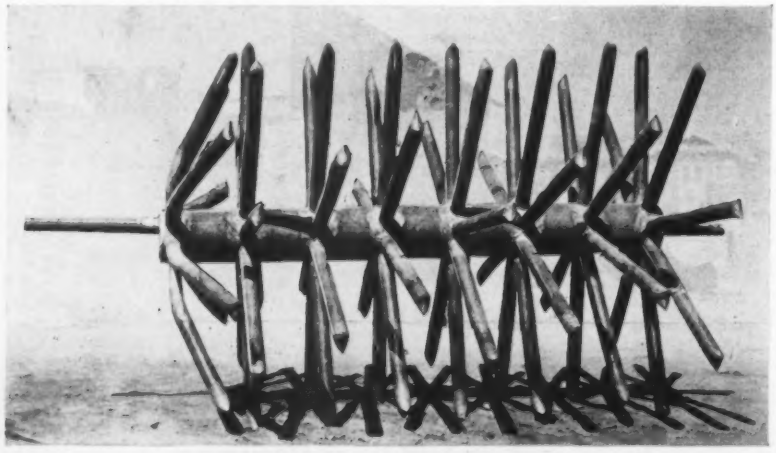
One of the smaller Western gasoline companies recently found it necessary to find a broader market for their product due to increased production. Until that time they had disposed of their entire output to crude oil operators, who used the gasoline to thin the heaviest oil so that it could be piped to the refineries.

The new market demanded a pure white gasoline, rather than the off-color product sold to the oil companies. It was necessary, therefore, to filter the gasoline through a special clay, similar to fuller's earth, to remove the impurities. However, it was found that after a brief period of use this clay became unserviceable, but could be reclaimed for further use if it could be satisfactorily dried.

After much experimenting it was found that a "porcupine" steam coil, fitted in a circular steel tank, gave the best results. Difficulty was met at first, since it was found impossible to fabricate this "porcupine" coil with standard pipe fittings. But by use of oxwelding the coil was very quickly made and installed.

The "porcupine" consists of a central feed pipe of 8-inch diameter, from which radiates arms or spines of 2-inch pipe. These spines are swaged and welded shut at the outer end and welded to the main pipe at the inner end. Eight rows or layers of spines are used, evenly spaced along the main pipe. Each row contains eight spires uniformly spaced about the circumference. The lowest row of spines is nested and bent upward to conform with the conical bottom of the tank.

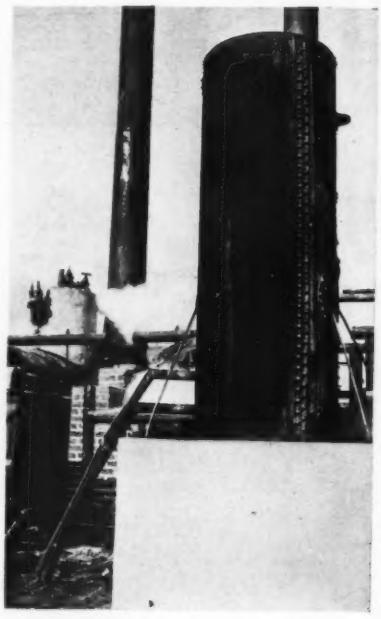
In this manner it is possible to secure an even heat throughout the tank and the clay is uniformly and thoroughly dried.



WELDED FELTER CLAY DRYER

This Blow-Off Pit Meets No Criticism

One of the minor problems with which refiners and natural gasoline manufacturers has to contend, is the disposal of sludges, water, and waste steam, derived from boiler installations at the time of the periodic "blow-down." Plants located in isolated sections are often excepted, for waste material and substance from their boilers may be blown off into any convenient sump hole or pond to accumulate with only the disadvantage of presenting a dirty spot on the plant grounds. Those plants, however, which are installed in congested areas, especially those in operation within city limits, are often governed by numerous city restrictions. It is often the case that these restrictions prohibit the accumulation of waste water and refuse. More often these rules do not permit such materials to leave the plant yards. Gasoline plants and refineries, then, which eliminate mud holes, deposits of sludge, and accumulation of such waste materials, are confronted with the problem of handling the boiler blow-off, steam, water and sludge, in such manner that hardly a trace is left of the procedure.



BLOW-OFF PIT

An example of how one manufacturer of natural gasoline overcame this problem cheaply and efficiently lies in the boiler blow-off equipment of the West Coast Refining Company at Richfield, Cal. In this instance the company engineers designed a blow-off tank to take care of this waste material, saving the water and returning it to the cooling pit.

The accompanying photograph illustrates the device as installed. A concrete pit was constructed with walls about four feet in height. This pit was then filled to within about 20 inches of the top of the outside walls. A concrete floor or section was then poured on top of the filling material. This gave a basin about 16 inches in depth. Into this basin an old boiler shell was upended and fastened to the concrete bottom of the pit. Holes were provided around the bottom circumference of the boiler shell for the escape of accumulating water. The blow-off lines from each boiler (four in number), enter this cylindrical receptacle laterally, or at an angle to the side of the shell. When a boiler is blown-down, or blown-off, the steam and water entering the device is given a whirling line of travel, causing the water and sludge to drop to the bottom of the shell, where it flows into the surrounding basin with concrete walls. The steam leaves the blow-down drum through a small opening at the top of the cylinder.

NEW EQUIPMENT, CATALOGS, BULLETINS, BOOKS

Petroleum Calculator Efficient

The Refinery Supply Company of Tulsa and Dallas, has placed on the market the new Fraser Petroleum Calculator, which is a simple, yet efficient, guide for determining the correct weight and measurements for oils of different specific gravities. This is charted so that any weight to measure or measure to weight at any specific or Beaume gravity may be found by moving the mobile arm until its straight edge is on the gravity indicated, when the data sought may be found. The outer circle is employed in conjunction with the mobile arm for temperature correction. This calculator is a cardboard chart to which is attached on the center a revolving arm, and by the use of this revolving arm one move will give the corrected gravity under all indicated temperatures, corrected to 60 degrees as per the A. P. I. tables. To obtain the volume corrections the segment or movable arm is then moved to the zero per cent point which lies upside the 60 degree to the range in which the gravity reading has been taken. For example:

To find the gravity at 60 degrees F., move indicated temperature opposite indicated gravity and then note gravity at 60 degrees F., under arrow.

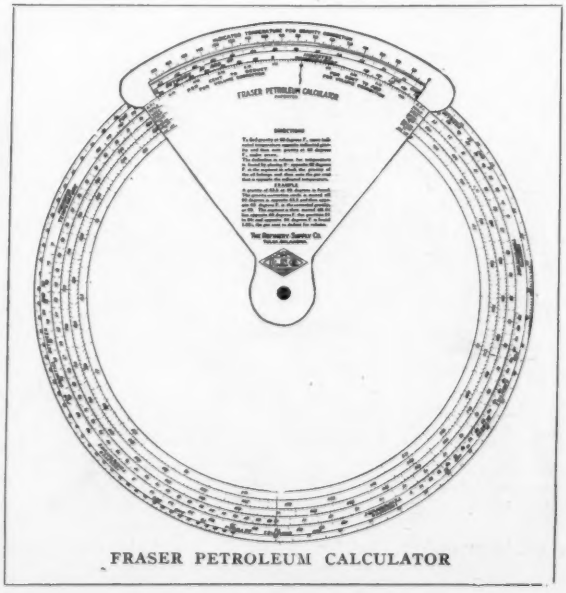
The deduction in volume for temperature is found by placing 0% degrees opposite 60 degrees F., in the segment in which the gravity of the oil belongs and then note the per cent that is opposite the indicated temperature.

Example:

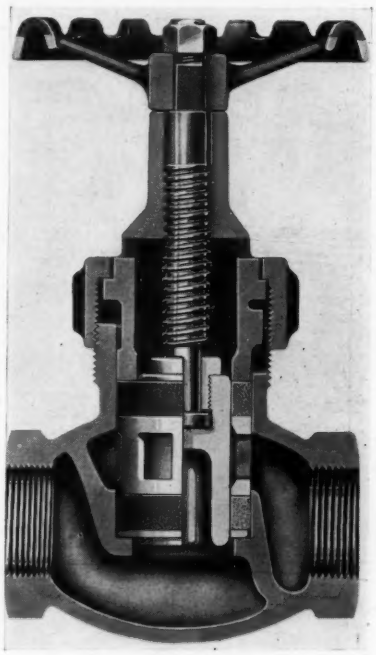
A gravity of 63.5 at 90 degrees is found. The gravity-correction circle is moved till 90 degrees is opposite 63.5 and then opposite 60 degrees F. is the corrected gravity, or 60. The segment is then moved until 0 per cent lies opposite 60 degrees. (For gravities 51 to 64) and opposite 90 degrees F. is found 1.82 per cent, the per cent to deduct for volume.

This calculator is designed to be of valuable assistance to oil refineries, purchasing companies, etc., whose business requires constant measurements and weights of the different gravities of oils.

More information can be secured from the company on request.



FRASER PETROLEUM CALCULATOR



SCHUTTE AND KOERTING PISTON TYPE VALVE

Piston Valve Enables Throttling

To enable throttling without damage to the valve, Schutte & Koerting Company, Philadelphia, has designed and placed on the market a piston type valve recommended to give reliable service under severe operating conditions.

This valve is being sold under the Klinger patents.

Body of the valve is of the usual globe or angle design. Shut-off is obtained by a cylindrical piston or plunger sliding vertically through two special packing rings separated by a bronze cage or lantern having ports through which the steam or other fluids flow when the valve is open.

A standard handwheel and screw spindle are used to regulate the position of the bronze piston, and the stuffing box and its nut provide a means of compressing the packing rings to insure a close fit around the sliding piston.

This arrangement is said to eliminate jamming action between the piston and packing rings.

The valves are easily opened and closed.

Only the lower end of the piston or plunger is exposed to the high velocity effect of the steam or other fluid when the valve is starting to open or is nearly closed.

Packing rings are kept tight against the sliding piston by screwing down on the stuffing box nut. Worn packing rings can be removed with the aid of a special tool which hooks under the lower ring, the two packing rings with the bronze cage being withdrawn as a unit.

Durac Hydrometer Has New Features

Superior features of construction are claimed for the new Durac hydrometer, made by Hiergesell Brothers, 2007-9-11-13, Bellevue Ave., Philadelphia, Pennsylvania.

In this hydrometer, the weight is permanently sealed off by a disc fused between the float and weight chamber.

Narrow construction at the neck of the hydrometer has also been avoided.

Further information can be secured from the company on request.

DURAC HYDROMETER

The Brown Instrument Company, Philadelphia, has appointed L. C. Wilson to handle sales and engineering service in connection with the distribution of the new Brown Electric Flow Meter in Pittsburgh territory. Mr. Wilson is well versed in flow meter applications having received special technical training in fluid flow and measurement under Prof. Gebhard, at Armour Institute, plus 12 years practical experience in the instrument field. During this period Mr. Wilson was actively engaged in sales and engineering work, chiefly associated with flow meters. With Mr. Wilson in charge it is expected that the distribution in Pittsburgh territory of The Brown Electric Flow Meter, embodying the interesting new inductance bridge principle, will rapidly go forward.

NEW MERCO-NORDSTROM PLANT AT OAKLAND, CALIFORNIA

Valve Company Builds Plant in Oakland

Oakland, Calif. — Another industrial plant, the facilities of which will be largely devoted to the manufacture of valves for the gas industry, has been established on the Pacific Coast.

Heretofore, Merco-Nordstrum plug valves have been manufactured on the Atlantic seaboard, but the executives of Merco-Nordstrom Valve Company, recognizing the increasing demand for their product in western America, came to the conclusion that business conditions warranted the establishment of a complete manufacturing plant on the Pacific Coast, thus permitting of economical distribution

The new factory is located in Oakland, Calif., at the corner of 24th and Peralta Streets, having an area of approximately 30,000 square feet and the installation of machinery is now under way, so that actual production can begin within a few weeks, according to the announcement of H. S. Shuey, secretary-treasurer of the firm. The factory will have every facility for the manufacture of plug valves in every different type.

Little more than 10 years ago Merco-Nordstrom valves were unknown. In 1916, a mechanical engineer, Sven Johan Nordstrom, working for a mining company in Mexico, observed that many serious troubles were being experienced in handling liquids of various character and air under pressure, due to the leaking and sticking of valves. He conceived the idea of introducing lubricant under pressure thoroughly covering the bearing surfaces of the plug so that the pressure of the plug itself would offset any pressure coming through the line. His invention of the Merco-Nordstrum valve was the beginning of every rapid development and other industries soon adopted the valve. At the present time the valve is perhaps represented in 100 or more industries.

In 1918 engineers of the Merrill Company entered into an agreement with the inventor to actively develop and introduce the valve. The manufacture and distribution was conducted by the Merrill Company until 1923, when the business became such a large part of its work that it was found feasible to incorporate a separate company.

Since the establishment of the Merco-Nordstrom Valve Company, which is a subsidiary of the Merrill Company, all of the manufacuring has been carried out on the Atlantic seaboard, but with the completion of the new Oakland plant, the two factories will be operated.

Expansion of business has necessitated the opening of an additional district office at 1501 Masonic Temple, New Orleans. The Texas office has also been removed to 1315 Petrolcum building.

Representatives' offices are maintained in San Francisco, Chicago, Cleveland, New York City, Houston and New Orleans.

The officers of the company are: Charles C. Broadwater, president; Sven Johan Nordstrom, vice president; Herbert S. Shuey, secretary and treasurer, all of whom are directors of the company, the other directors being Charles W. Merrill and Louis D. Mills, the former president, and the latter consulting engineer of the Merrill Company.

Booklet on Corrosion

The Detroit Graphite Company, Detroit, Mich., has just issued a new booklet on rust prevention, a portion of which is devoted to corrosion problems in the oil industry.

Copies of the bulletin will be mailed on request to the company.

Wiggins Floating Roof Catalog

"Stopping Evaporation" is the name of a 24-page booklet which has just been issued. It describes how the Wiggins roof, a device which rides directly on the oil in a tank, prevents oil from passing into the air.

The Wiggiins roof was first placed on the market the latter part of 1923. Its success is indicated by the large number of installations that have been made at a rapidly increasing rate in so short a time. This success, the booklet states, is attributable to the gas-tight seal which closes the space between the deck of the roof and the tank shell.

The design of the Wiggins roof has remained unchanged since its inception. A few mechanical details have been simplified and standarized recently. The material in the new booklet covers these improvements.

The text matter of this booklet, which deals with a highly technical device, is written in such a manner as to be easily understood by the non-technical as well as the technical reader. In addition, the discussions of specific parts are clearly illustrated.

A general picture section in the center of the booklet shows installations on many different types of tanks at as many different locations. Results of evaporation and fire tests are also treated in detail.

Copies of "Stopping Evaporation" may be obtained free of charge by writing the Chicago Bridge and Irion Works, 37, West Van Buren Street, Chicago, Illinois.

Braun Opens New York Office

New York.—Announcement has been made by C. F. Braun and Company, Manufacturing Mechanical Engineers, Alhambra, California, of the opening on April first, of a sales and engineering office in the new French Building, 551 Fifth Avenue. William D. Moorer, formerly manager of the Tulsa office has been appointed district manager. The new office, it was said, will make possible a closer contact with the large clientele of the company on the East Coast and abroad. Other branch offices are now maintained at Tulsa and Dallas.

Temperature Control Bulletin

"The Widening Field of Automatic Temperature Control," is the title of a recent bulletin published by the Sarco Company, Inc., 183 Madison Avenue, New York City, New York.

Joseph A. Maguire, consulting engineer, is author of the pamphlet.

Copies can be had upon application to the company.

TULSA TYPE

MULTITUBULAR HEAT EXCHANGERS

LOW PRESSURE DROP
HIGH EFFICIENCY
ECONOMICAL

Over 600 of these Heat Exchangers were put in service in the past 6 months

Immediate shipment from stock on standard designs.
Prompt deliveries on special construction.

Tulsa Boiler & Machinery Company
P. O. Box 1963 TULSA, OKLAHOMA

Revised Issue of Tag Manual

The C. J. Tagliabue Manufacturing Company of Brooklyn, N. Y., have just published the 20th revised edition of the New and Revised Oil Manual for Inspectors of Petroleum. This edition has been brought up to date and includes the A. P. I. gravity temperature correction tables as revised and adopted by the U. S. Bureau of Standards, the U. S. Bureau of Mines and the American Petroleum Institute. Besides these new and official tables, the manual includes thirteen other tables and detailed procedure for conducting 32 routine oil tests.

The manual contains 120 printed pages with eight blank pages to be used as memorandum data sheets, its size is 5x8 inches.

Copies may be received on request, from the company.

Hills - McCanna Opens Branch Office

Houston.—Hills-McCanna Company, 2025 Elston Avenue, Chicago, has opened a branch office in Houston at 701 Keystone Building. A. P. Wright, Southern district manager, is in charge.

Due to the increase in business, it has been found desirable to have a direct representative of the company to handle Texas, Louisiana, Arkansas, and the Houston office is in a position to give full service on problems that develop in that territory.

The company manufactures steam specialties, non-ferrous castings, and specializes in force feed lubricating systems.

Hot Oil Valves Part of Walworth Line

Walworth Company, Boston, has added to its well-known line of valves a class of steel valves available for hot oil pressures, including 400, 600, 900 and 1350 pounds, temperature 750 degrees.

The valves are trimmed with Sigmalloy No. 351, a valve trimming developed through extensive metallurgical research, and said to have superior qualities of heat and corrosion resistance, and also strength. The material is especially recommended for use in fields where severe service is demanded.

Two Sigmalloy valve trims, Nos. 222 and 351, have been announced to date. The former is available and recommended for steam installations at 150 and 300 pounds, at temperatures up to 750 degrees F. No. 351 is now available for 400, 600, 900 and 1350 pounds valves in steam and oil lines at high temperatures. The class AA valves, ranging as high as 1000 degrees F. in temperature ratings, are designed particularly for oil refinery service.

More information will be provided by the company, on inquiry.

Soaking Drum Cleaner Does Job Quickly

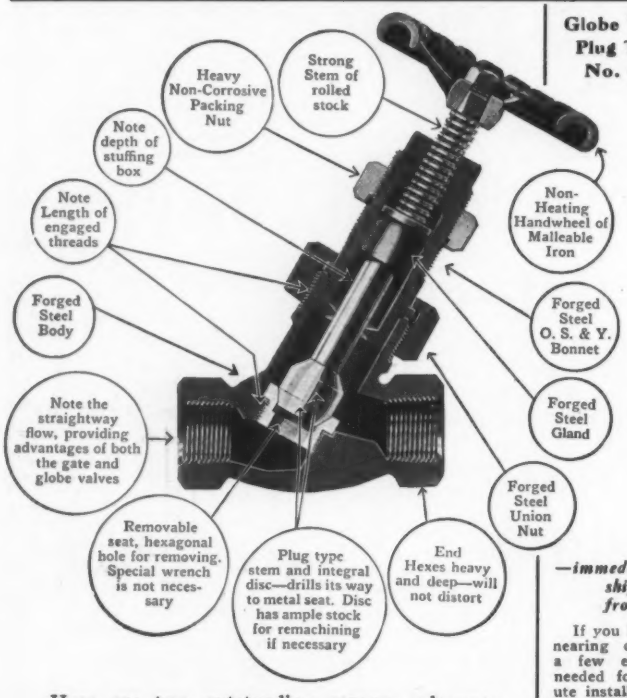
The Hughes Soaking Drum Cleaner has been developed by the Hughes Tool Company, Houston, Texas, for removing coke deposits that collect in soaking drums or reaction chambers, especially in connection with the Carleton Ellis (tube and tank) and the Dubbs processes.

The apparatus consists of a hydraulic cylinder sunk in the ground under the center of each drum and containing a rotable drill stem. A steam driven portable rotary for driving the drill stem is provided and can be moved from one unit to another.

A fish tail bit with reaming arms is first used to drill a hole approximately three feet in diameter (in six foot drums) through the coke body. The bit is then removed and the cleaner, consisting of three hinged arms, each carrying two bronze discs on chains, is inserted in the drum. The discs swing out and beat the coke off the wall of the drum as the drill stem is rotated. The coke falls in a hopper and is discharged through a chute by a series of paddles.

Complete cleaning of a six by 48-foot drum carrying 35 feet of coke can be accomplished in about one and one-half hours.

Edward Forged Steel Valves


Globe Valve
Plug Type
No. 682
Heavy Non-Corrosive Packing Nut
Strong Stem of rolled stock
Note depth of stuffing box
Note Length of engaged threads
Non-Heating Handwheel of Malleable Iron
Forged Steel Body
Forged Steel O. S. & Y. Bonnet
Note the straightway flow, providing advantages of both the gate and globe valves
Forged Steel Gland
Forged Steel Union Nut
Removable seat, hexagonal hole for removing. Special wrench is not necessary
Plug type stem and integral disc—drills its way to metal seat. Disc has ample stock for remachining if necessary
End Hexes heavy and deep—will not distort

Here are two outstanding reasons why you should standardize on Edward Forged Steel Valves.

(1)—designed and built for service up to 500 pounds pressure and intermittent temperatures to 1100° degrees F.—they therefore will fit any service need within this range.

(2)—because of quantity production these high grade valves are priced LOW ENOUGH to justify their use even in service far below their maximum rating.

The Edward Valve & Manufacturing Company
Main Office and Works East Chicago, Ind.

Maintenance Engr. Corp., 1802 Conti St., Houston, Texas
Chapman Valve Mfg. Co., P. O. Box 974, Tulsa, Okla.

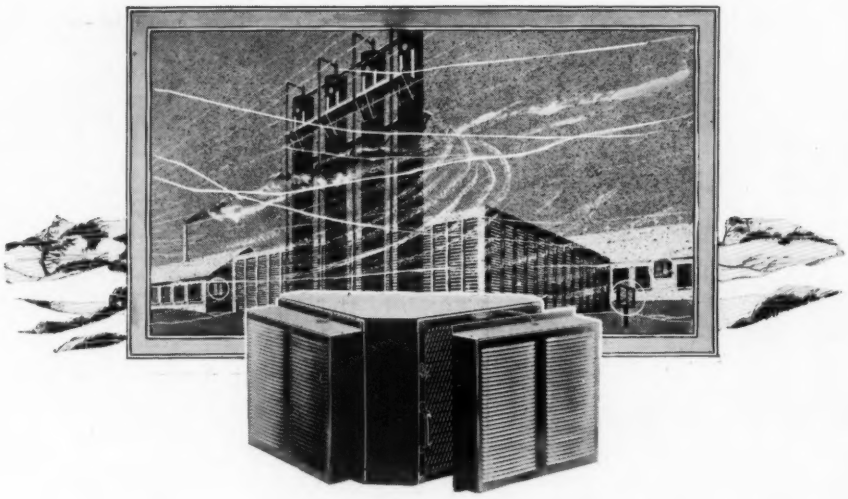
—immediate shipment from stock

If you have a plant nearing completion—a few extra valves needed for last minute installation — an emergency arises where valves are needed quickly—wire Edward — specify "Forged Steel Valves" — immediate shipment will be made — any quantity and any size from ¼-inch to 2-inch inclusive.

Edward Forged Steel Valves are made in both Globe and Angle pattern—Plug Type or Edward Protected Seat and Disc.

Ask for Refinery catalog.

—for every refinery service



In the wake of the Sandstorm—

Sandstorms are a common occurrence in the Oil County.....high winds that fill the air with sand, dirt, grit.

Engine and compressor users know that following such a storm there is likelihood of trouble from the wear occasioned by sand and dirt sucked into the vitals of the machine.

As a definite protection many leading operators have adopted Reed Air Filters as standard equipment, filtering all air clean of dust, sand and dirt before it reaches the engine or compressor.

As a result, expensive shut-downs and repairs are minimized and the cost of installation of Reed Air Filters becomes a real, money-making investment.

Write us for illustrated Bulletin describing Reed Air Filters and the service they can render you.

REED AIR FILTER COMPANY, INC.
Louisville, Kentucky

Distributed to the Oil Industry by

SMITH SEPARATOR COMPANY
Tulsa S *Okla.*

Texas Offices:
924 Post Dispatch Bldg., Houston, Texas
1414 F. & M. Bank Bldg. Fort Worth, Texas

California Office:
2039 E. 38th St. Los Angeles, Calif.

Louisiana Office:
240 Dalzell St. Shreveport, La.

Mention Where You Saw the Advertisement

Refinery Directory Now Ready

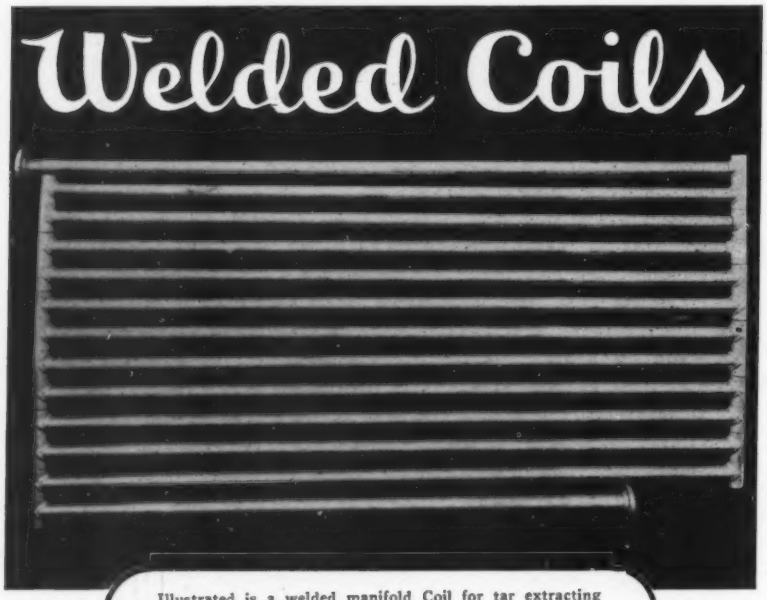
The aggregate refining capacity of the petroleum refineries of the United States continues to manifest an increase, although the number of refineries has decreased, the United States Bureau of Mines, Department of Commerce, finds as the result of a statistical survey conducted by G. R. Hopkins, associate petroleum economist, as of January 1, 1927. On that date there were 465 completed petroleum refineries in the United States, with a total daily crude oil capacity of 3,061,007 barrels. In addition, 7 refineries with a potential capacity of 61,000 barrels, were in process of construction. Of the completed refineries, 327, with a capacity of 2,834,282 barrels, or 93 per cent of the total capacity, were in operation and 138, with a capacity of 226,725 barrels, or 7 per cent of the total, were shut down.

Comparison with the figures of a year ago reveals that during the year 1926 there was a net decrease of 45 in the total number of completed refineries, but an increase in total capacity of 208,040 barrels. This resulted from a steady growth on the part of many of the larger refineries, particularly those on tide water, which overbalanced the decrease in capacity due to the abandonment of a number of relatively small skimming plants.

The building program as of January 1, 1927, was somewhat larger than that of January 1, 1926. California maintained her rank as a leading State from the standpoint of refinery throughput, though Texas still leads in number of refineries. Practically all of the decrease in total number of completed refineries occurred in the Mid-Continent field; that is, the States of Kansas, Oklahoma and Arkansas, and including the northern parts of Louisiana and Texas. In Oklahoma, approximately 15 refineries were dismantled in 1926. The only section of the Mid-Continent field where construction activity was in evidence was the Panhandle district, where the absence of trunk pipelines served as the inducement for the building of several skimming plants. Of more than passing importance was the completion during the year, by the Gulf Refining Company and the Mexican Petroleum Company, of refineries at Bayonne, N. J., and Baltimore, Md., respectively, and the building of refineries by the former company and the Roxana Petroleum Corporation at Philadelphia and East Chicago, respectively, both of which are nearing completion. Washington entered the list of States with refineries, having on January 1, two operating refineries with a total daily capacity of 5000 barrels. This expansion of refinery capacity near large consuming centers and the wholesale dismantling of plants near inland producing areas has become a definite trend, the chief cause of which is that crude oil can be transported at lower cost than refined products. Western Pennsylvania, the stronghold of the small refiner, held its own in 1926 in point of refining capacity. The Rocky Mountain area also showed little change in refining capacity, the chief event of the year in this district being the completion of a refinery at Craig, Colo., by The Texas Company.

Of the total number of plants, completed or building, 271, of capacity 797,682 barrels, or 26 per cent of the total capacity, were skimming plants and 40, of capacity 1,490,000 barrels, or 48 per cent of the total, were complete plants. This compares with 29 per cent skimming and 44 per cent complete on January 1, 1926. The remainder were of various types, such as topping plants in California, or of combinations of types, such as the familiar skimming and lubricating oil plant of the Appalachian area. The rapid increase in consumption of gasoline, linked with keen competition, has stimulated the spread of cracking processes, and the year 1926 witnessed the installation of much cracking equipment both in the larger plants, which already had some equipment, and in the smaller skimming plants.

The refinery industry in the United States during the past year has furnished a good example of the working of the law of the survival of the fittest, the Bureau of Mines points out. The greater portion of the refineries dismantled in 1926 were constructed during the boom times of 1920 apparently in the hope that the price of gasoline would hold its wartime increment. It is now history that gasoline, unlike most other commodities, declined sharply in price following 1920,



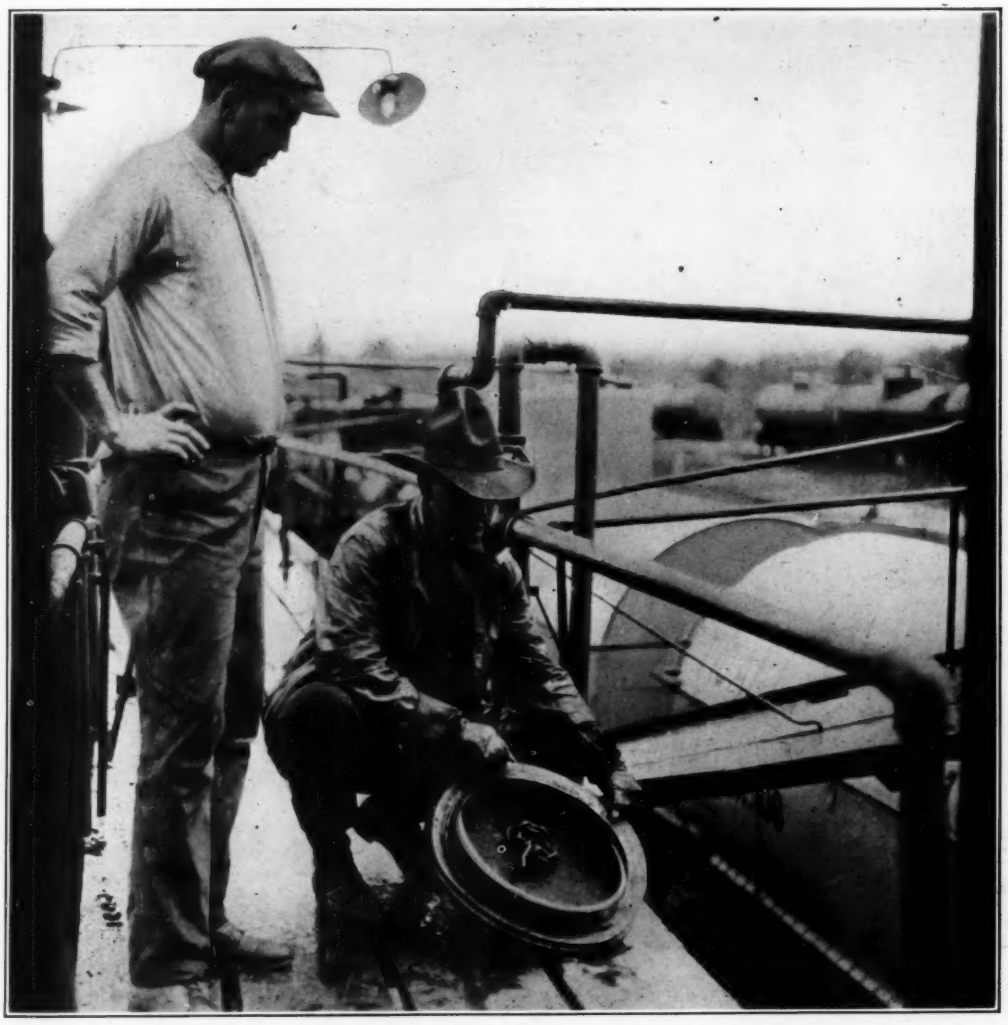
Illustrated is a welded manifold Coil for tar extracting plant of seamless tubing throughout, and designed for complete circulation.

Special Chemical Processes

often demand material not standard in design, dimensions or practice. When such requirements are put up to "Power Piping" unfailing solution is assured. Behind every order, no matter what, Power Piping engineers can bring an experience that guarantees efficiency and economy —and positive satisfaction to you! We welcome inquiries from the oil industry!

Power Piping Company
Pittsburgh

Power Piping



"Here's a Dome Cover Gasket That's Really Gasoline-Proof!"

Ask your loading-rack men about tank car gaskets. Hear their tales of cheap gaskets that only last one trip—listen to them cuss about dome covers "frozen" tight, due to sticky, swollen gaskets!

Why not eliminate these troubles—and reduce "outage" losses at the same time—by standardizing on "U.S." Composition Gaskets for dome covers and outlet caps.

No gasket will give you as great efficiency and as many trips per dollar invested. No more "frozen" dome covers. Gasket creeping eliminated. Leaky outlet caps a thing of the past.

"U.S." Gasoline-proof Gaskets have been officially adopted by many of the larger refineries and gasoline shippers.

May we send you further particulars?

United States Rubber Company

1790 Broadway, New York City

OIL FIELD SALES BRANCHES:

Tulsa, Okla.
Houston, Texas
Columbus, Ohio
Chicago, Ill.
Pittsburgh, Pa.
New Orleans, La.

Kansas City, Mo.
St. Louis, Mo.
Los Angeles, Cal.
Dallas, Texas
Memphis, Tenn.

"U. S." TANK CAR GASKETS

Mention Where You Saw the Advertisement

Vapor Phase Refining by Means of the Gray Catalytic Tower

(*Continued from page* 53)

the vapors and rate at which the vapors are passed through the clay. The results given here represent average conditions:

	No. of barrels yield per ton of clay.		
Pressures (pounds) .....0-10.	150	500	
Vapor tower 31½	31	31	
Bubble tower 31	30½	30½	
Gray tower (inlet).....28	27	27	
Gray tower (outlet)....26	25	25	
Gas separator 16	16	17	
Temperatures (degrees Fahrenheit):			
Bubble tower 330	330	330	
Gray tower (outlet) 335	325	315	
Gray tower (inlet) 325	325	325	

The record on the clay charges is kept by the yield clerk in the office and a daily report is given to the still foreman. A convenient form of report for this is shown below:

GRAY TOWER OPERATIONS
7 A. M.,.....1927

Tower.		1	2	3	4	5
Barrels of gasoline through clay.	Today	345	..	355	..	680
	To date 1050	..	2730	..	10,290	
	Per ton of clay	175	..	455	..	735
	Batch	5	6	5	3	2

The yield on the clay in towers one, two and three are obtained by dividing the total through to date by six, since six tons of clay were charged. Similarly four and five are divided by 14, since 14 tons were charged in each. The report shows that towers one, three and five are in use and the yields to date are 175, 455 and 735 barrels per ton of clay, respectively. It also shows that towers two and four contain batch No. 6 and No. 3, and to ascertain if these contain fresh or used clay it is necessary to refer to previous reports.

Should the stream go off color in the middle of a run on the pressure still it is then necessary to cut into the idle tower. This operation is much the same as cutting into a tower at the beginning of a run. The outlet on the cool tower is closed and the reflux and polymer lines opened to the slop tank. The vapors are then gradually cracked into the tower until the line is wide open. After closing off gradually on the vapor line to the used tower, the operator then proceeds as when cutting into a tower at the beginning of a run.

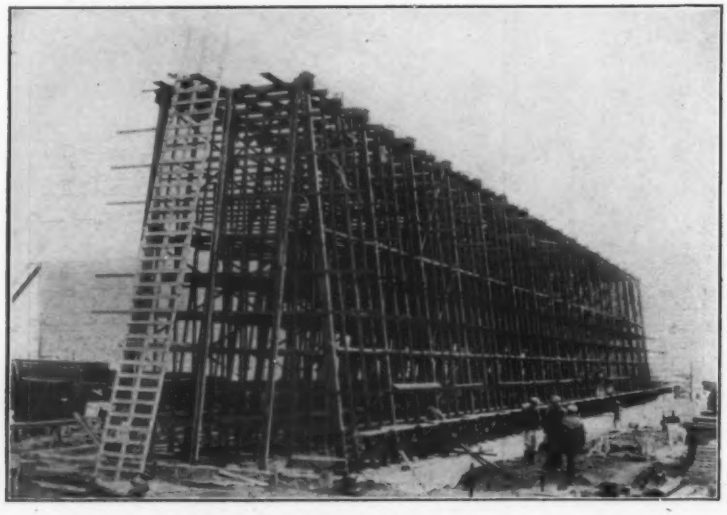
The shutting down is also another important item in connection with the operation. This has reference to when the still run is completed and the clay has not yet reached its maximum yield. The still is first "pulled down" and the vapors then left in the tower for one hour longer. The inlet and outlet vapor lines are closed. Usually there is one man at each valve and the valves are closed about simultaneously. The automatic steam regulator on the reflux line is shut off and both the reflux and polymer lines are left open to permit draining of the tower. The pressure is let die down to five pounds, all the lines are then closed, and in the language of the operators, the tower is left "bottled up," ready for use in the next run.

Properties of Gasoline

When the clay is ready to dump, the tower is left "bottled up" as usual. About 20 pounds of steam is then cut into the tower and the steam outlet is opened to the sump. Steaming is continued for about five hours, or until the steam has a "sweet" odor. To determine when the steaming is complete, the valve at the bottom of the polymer pot is opened occasionally after the tower has been steaming about the desired length of time, and the odor noted. When done, it should show only a slight gasoline odor. The tower is then unheaded, the clay is dumped into a truck and hauled to the filter plant for burning. Little difficulty is experienced in emptying the tower, since the clay is comparatively dry.

The next item of interest after going through the operation of the process is perhaps the properties of the gasoline made by the process. It need only be said here that the gasoline obtained (after being sweetened) possesses good marketable qualities and shows good color stability. Nothing definite can be given in regard to this, however, since these qualities are dependent on such factors as the grade of gasoline treated, yield of gasoline taken from the clay and method of operating the towers.

Of utmost importance, naturally, is the



Building the largest single Atmospheric cooling tower in the United States. In operation at a large refining plant in Oklahoma.

Erecting a Modern Cooling Tower
—a Job for Specialists Exclusively

A modern cooling tower for refinery use is something more than a frame with decks and louvres. Its design and performance are based on years of experience and observation in this field. Building a modern cooling tower is a job for specialists exclusively.

Our company is composed of engineers whose long experience with cooling water problems entitles them to your confidence. We have designed and built cooling towers and spray nozzle cooling systems for firms like Marland Refining Company, Humble Oil & Refining Company, Union Oil Company, Roxana Petroleum Company, and others equally well known.

Write for Literature

THE COOLING TOWER COMPANY, INC.
15 John Street New York

Houston, Texas
The J. A. Rossiter Co.,
410 Union Nat'l Bank Bldg.

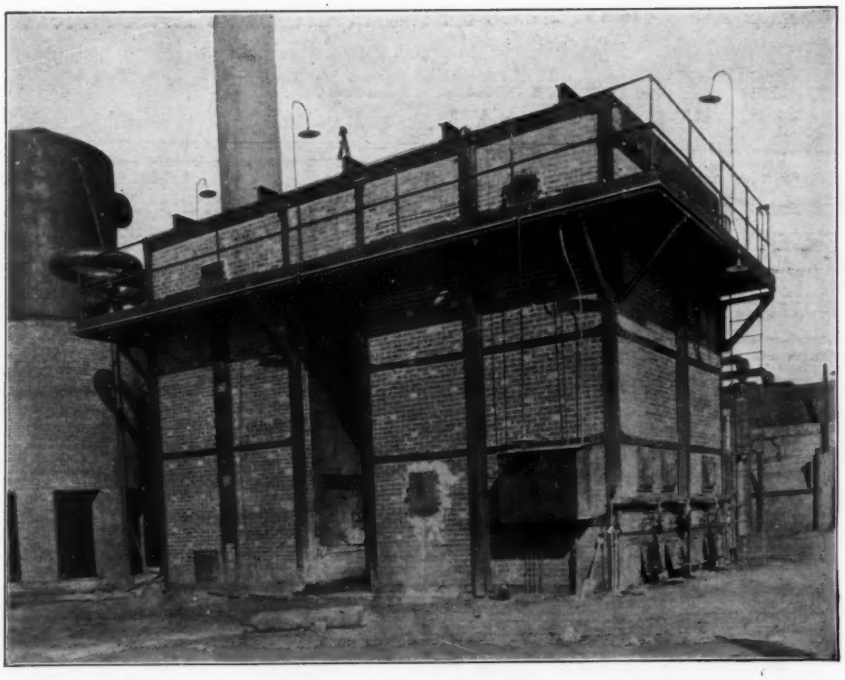
Tulsa, Okla.
J. F. Pritchard & Co.,
910 Mid-Continent Bldg.

Los Angeles, Calif.
N. O. Fleming Co.,
5815 Maywood Ave.,
Huntingdon Park

Representatives in other Principal Cities

FOSTER

TUBE STILLS



OVER 500 Foster Tube Stills are operating with a high degree of efficiency in topping crude oil, re-running distillates, recovering light oils, continuous distillation, distilling crude coal tar, cracking, producing lubricating stock, preheating, cooling oil vapor, heating asphalt, refining vegetable oils, and many other industrial oil heating operations.

Write for special bulletin on tube stills

POWER SPECIALTY COMPANY

111 BROADWAY, NEW YORK

Branches in All Oil Centers

Mention Where You Saw the Advertisement

Guesswork

Even under the best conditions and with the most reliable help, hand control of temperature is inefficient, uncertain. It is absolutely impossible to maintain any given temperature indefinitely by human means.

Why put hundreds, even thousands of dollars at stake when for a few dollars you can be absolutely certain to maintain automatically any desired temperature between 30° and 300° F. with the

SARCO Temperature Regulator

It eliminates human fallibility and makes temperature control a mechanical certainty.

The Sarco is entirely self-contained and needs no outside attachment or operating medium, such as electricity, compressed air or water pressure.

So simple and composed of so few parts that there's no danger of it getting out of order.

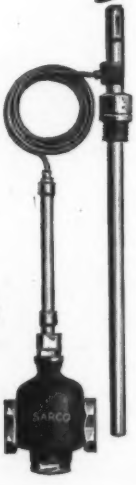
Sold on 30 days' free trial and returnable if it doesn't meet your requirements.

For full particulars write for Booklet S-92.

SARCO CO., Inc.

183 Madison Ave., New York

Cleveland Buffalo Chicago
Boston Detroit Philadelphia



Certainty

78 Oil and Refining Companies now using the

Mettler Entrained Combustion Gas Burners

For All Purposes, Kinds of Gas, Pressures

Write for Latest Condensed Catalog

Lee B. Mettler Co.

406 S. Main St. Los Angeles, Cal.

yield obtained from the clay and this coupled with quality of product, is the end toward which the operator is constantly working. There are four main factors which determine the yield that can be obtained—composition of vapors, grade of clay, burning of clay and proper removal of polymers. The first factor of course has to do with the cracking operations and is governed solely by these and the kind of cracking stock used. In regard to the clay, the 60-90 mesh is best adapted for use and yields will vary to some extent with the different grades. It appears that best results are obtained with the new clay after being given a preliminary roasting as for percolation work. In regard to the removal of polymers, it is enough to say that after having polymerized the undesirable constituents, sufficient precaution should be taken to assure their removal. These factors when properly controlled will surely mean maximum yields.

It seems that most refiners ordinarily think in terms of acid treating when discussing the treatment of light oils, and it is therefore quite natural that one should ask how the method compares with acid treating. This will be answered by giving a few points favoring the Gray process. They are as follows:

1. Simplicity of installation and operation.
2. Minimum tankage.
3. Elimination of rerunning.
4. Removal of undersirable constituents.
5. Small loss.
6. Results not subject to seasonal conditions.
7. Economical.

Most of these points are self-explanatory. It is claimed by the patentee of the process, as stated in an earlier paragraph, that only the undesirable constituents, such as di-olefines, are removed by the polymerization, and the results obtained indicate this to be correct. Actual losses may therefore be considered negligible, since the polymers that are formed go into fuel oil. One redeeming feature is in regard to results being unchanged by seasonal conditions. With acid treating of cracked distillates it is not at all unusual for the refiners' troubles to multiply with the approach of the warmer Summer months, but this is no source of trouble in the Gray tower process. In regard to cost, let it merely be said that the method ordinarily shows a lower cost than acid treating. All of these features combine to make the process very interesting and attractive to the modern refiner.

Skelly Revises Plans in Texas Panhandle

Tulsa.—The Skelly Oil Company has revised plans for building the natural gasoline plant on the Schafer ranch, in the Texas Panhandle. At this time only one plant will be constructed to take care of gas now available.

The decision is in keeping with plans of the company to curtail all forms of development until market conditions in the oil industry are better.

one of the chief reasons being the oversupply.

To make the directory of more value, this year the different railroad connections over which tank cars have access to the refinery, are given.

Copies of the 1927 directory of petroleum refineries of the United States, may be obtained from the Bureau of Mines, Department of Commerce, Washington, D. C.

Valve Company Names Distributors

Chicago.—The Edward Valve and Manufacturing Company, East Chicago, announces that the company is to be represented in the Minneapolis territory by H. J. Meier, 459 N. W. National Life Building, Minneapolis, Minnesota.

In the Detroit territory, E. W. Nicklin Company, 12-231 General Motors Building, Detroit, Michigan, will represent the Edward Company.

These changes became effective on April 1.

Lincoln Sales Staff is Enlarged

Cleveland, Ohio.—The Lincoln Electric Company announces the following changes in its sales personnel:

G. N. Bull, formerly with the Worthington Pump and Machinery Company in their Washington, D. C., office, has been made district manager of the New York office of the Lincoln Electric Company.

C. S. Freeman, formerly in charge of the Lancaster office, has been transferred to the Buffalo office and made district manager.

S. W. Shultz, formerly of the Philadelphia office, has been put in charge of the Lancaster office.

Ed. J. Pfister, formerly of the Buffalo office, has been transferred to the Philadelphia office.

Gradon Bulletins Are Announced

The Gradon Manufacturing Company, 2320 East Tioga Street, Philadelphia, Pa., has published three bulletins recently, of interest to refiners.

Bulletin No. 11 describes wrought construction expansion joints, sliding sleeve type, from three-fourths inches to 72 inches.

Bulletin No. 21 is devoted to steam separators, plain and receiver types.

Bulletin No. 31 gives detailed information on storage water heaters, U-tube type.

Copies of either or all the bulletins will be mailed on request to the company.

55,000 bbl. Tank at The Texas Company's West Tulsa Refinery. One Coat of Two-Fifty Iron Primer. Two Coats of Bitulumin.

The phenomenal increase in the use of aluminum paints by the Oil Industry is due to TWO FACTS.

Aluminum paint reduces evaporation losses. This is well understood.

However it is not so well known that a correctly made aluminum paint will outlast the best lead and zinc paints by TWO to ONE.

BITULUMIN has been time-tested by hundreds of operators in the Oil Industry.

BITULUMIN is also recommended for painting tank cars, metal buildings, refinery equipment, still towers, water tanks, bridges, etc.

BITULUMIN is put up in double containers only.

HILL, HUBBELL & COMPANY

Manufacturers of Highest Grade Oil Industry Paints and Pipe Line Coatings

FACTORIES AT SAN FRANCISCO AND TULSA

District Offices

331 W. Eleventh St. LOS ANGELES
2412 First Ave., S SEATTLE
1006 Washington Ave., HOUSTON
51 First St., PORTLAND
15 Moore St. NEW YORK
600 E. Lombard St. BALTIMORE

NORTH AMERICAN CAR CORPORATION
N.A.
TANK CARS
LEASED AND REPAIRED
NORTH AMERICAN CAR CORPORATION
327 S. LaSalle St., Chicago, Ill.
Tank Cars for Lease
Domestic and Export Terminals: Chicago, Tulsa, New Orleans

Thermodynamics of Some Refining Problems

(Continued from page 66)

being attained by evaporators was equaled at a continuous battery taking 50% overhead, it would mean that three-quarters of the total distillation would be done in the waste heat recovery apparatus, and the fuel consumption should be under ½% of the throughput.

There is another way, and one of great interest thermodynamically, in which 100 Calories in the fuel can be made to supply more than 100 Calories for distillation. Harking back to our hypothetical town situated near sea level, and suppose that water at low pressure is required for some purpose in the town. This water may be obtained from the high level spring situated above, and if 100 tons is required, then 100 tons must be obtained from the spring; but suppose that instead of using it directly, this high-pressure water is used to drive a turbine, and that the latter is in turn connected to a pump arranged to pump water up from the sea to the town. As the town is near sea level and the pumping head consequently small, a small amount of high pressure water taken from the spring, may be made to lift a much larger amount up from sea level to the town. If, for instance, the spring were 1000 metres above the town and the latter 100 metres above sea level, then for every 100 tons of high pressure water taken from the spring, 1100 tons could theoretically be delivered to the town.

Returning to heat. It is possible to use high grade heat as given by burning fuel, to work an engine which can in turn be coupled to a heat pump, which may be used to pump up heat from a lower to a higher temperature. If the temperature rise against which the heat pump worked was comparatively small, a larger quantity of heat would be delivered by the pump, than was contained in the fuel fed to the engine. Applying this principle to distillation, the heat passing over to the condenser, would be raised to the still temperature by a heat pump and put back into the still. A practical arrangement might be as follows: A gas compressor acting as the heat pump, and driven by some suitable prime mover, such as an oil engine. The vapors from the still would be taken by this compressor, slightly compressed and consequently raised in temperature, and then passed through coils immersed in the still, in which they would be condensed and could be drawn off in the usual manner. There would thus be no separate condenser in the usual sense, the still acting as its own condenser. Let us see what sort of a performance we might expect from an arrangement as outlined above. If T_1 be the temperature before compression and T_2 the temperature after, a compressor working on the Carnot cycle would deliver $\frac{T_2}{427\,(T_2-T_1)}$ Calories for every kg. M. of work put into it. Assuming a still temperature of 150°C (423°A), a temperature difference of 20°C to be required to cause the necessary heat exchange and the internal efficiency of the compressor to be 60%; then for every kg. M. put into the compressor

$$\frac{443}{427\times 20}\times 0.6 \text{ Calories}$$

would be delivered. A good engine will deliver 100 kg. M. for every Calorie supplied to it so that combining the two we have

$$100\frac{443}{427\times 20}\times 0.6=3.11 \text{ Calories}$$

supplied to the still for every Calorie put into the engine, or a ratio of just over 5 to 1. There would be various losses such as radiation not allowed for above; but it appears reasonable to expect that under the conditions outlined for every Calorie given to the engine in fuel three Calories might be put into the still.

The type of distillation plant outlined in the last paragraph **does not necessarily require the combustion of fuel for its operation;** the heat pump could quite suitably be driven by a water turbine. The rising cost of fuel may quite possibly encourage some such arrangement and lead to the development of the hydraulically driven still.

LARGEST JOBBER
"TAG"
Controllers, Recorders, Thermometers
and
Oil Testing Instruments
THE REFINERY SUPPLY CO.
Largest Scientific Material House in the Southwest
Fourth and Detroit
Tulsa, Oklahoma
917 Santa Fe Bldg.,
Dallas, Texas

Mention Where You Saw the Advertisement

REFINERY AND GASOLINE PLANT ACTIVITIES

Building Carbon Black Plant in Panhandle

Amarillo, Texas.—Construction work has been started on the Magnolia Petroleum Company's carbon black plant in the Wilcox-Pampa field, Gray County, and when completed the plant will utilize about ten million cubic feet of residue gas daily from Magnolia's natural gasoline plant on a nearby lease. This plant represents two units previously used in burning residue gas from Magnolia's gasoline on the J. R. Smith farm, located near Breckenridge, and the removal was due to declining gas production and a partial market outlet for the current supply of residue gas. However, one unit has been retained on the Smith farm, and will continue operating until a market is available for all the residue gas.

Magnolia's Breckenridge carbon plant was one of the first to be erected in Texas, and developed an average yield of one pound of carbon black per 775 cubic feet of natural gas. More than five million pounds of carbon black has been manufactured by this plant. The burner tips on the two units being erected in the Texas Panhandle will be equipped to burn 12 cubic feet of gas per minute, instead of eight feet per minute. W. M. "Bill" Ray has charge of the carbon black operations of the Magnolia.

Moving Gasoline Plants To Borger, Texas

Fort Worth—The Associated Producers Gasoline Company, recent purchasers of the Cal-Tex Gasoline Company, is dismantling and moving the three gasoline plants of the purchased company, located in the Panhandle area, to one central site or location, close to Borger, Texas. These three units are of the portable type. The Associated Company has also installed on the same location a Southwestern "75" unit. The same company is also constructing a permanent plant a mile west of this location.

Improve Crystal Plant at Shreveport

Shreveport, La.—The Crystal Oil Refining Corporation has recently given a contract to the Widdell Engineering Company, and Arthur G. McKee & Co. associates for the immediate construction of a 4500 barrel capacity pipe still and bubble towers. The constructing company's engineers are on the ground at Shreveport to supervise the immediate erection of the new unit. Crystal Oil Refining Company has been making many improvements in its plant operation and processes during the last year, and the installation of two Jenkins cracking units is included in the extension program. Both of these units are now in operation.

The hook-up at this plant when the improvements are completed, will be somewhat of a change from usual practices. It is planned that the residuum from the shell still battery will be taken directly in continuous flow into the pipe still through a series of heat interchangers, and the gas oil cuts (or cracking stock) taken off the pipe still operation are to be conducted directly to the Jenkins cracking units, through heat exchangers.

Carter Starts Additional Plans at Seminole

Tulsa.—The second natural gasoline plant installed by the Carter Oil Company has started operation, in the Seminole field of Oklahoma. It is known as the Grisso plant and is located in Section 15-9-6. The plant is a permanent installation with a rated capacity of 20,000,000 cubic feet of gas daily. The plant is of the absorption type, being similar to the two installations owned and operated by the Carter Company in the Cromwell field. All of the auxiliary equipment is electrically operated.

Later in the month the Carter Company will place another plant in operation. This will be known as the Searight plant, located in Section 34-10-6. It will also have a rated capacity of 20,000,000 cubic feet of gas daily. For some months the company has been operating a two-unit portable absorption gasoline plant in section 35-10-6.

Olinda Gasoline Plant Undergoing Changes

Los Angeles—The old compression gasoline plant of the Olinda Gasoline Company operated at Olinda, Cal., in the Brea field district of Orange County, is being converted from compression into an absorption type plant. The compression plant will be employed as a booster station. The new equipment is being installed by the engineering firm of Boner & Sheldon, Los Angeles. One four-foot diameter absorption tower, and a combined stripper and fractionator of the same diameter are to be used, this equipment being of Boner & Sheldon design. J. F. Vordermark of Los Angeles is manager of the Olinda Gasoline Company.

Laredo Plant to Crack Mirando Crude

Laredo, Texas.—The Motor Fuel Products Company has secured charter permit from the State of Texas, with 2500 shares of no par value. This company will erect a cracking plant at Laredo for the purpose of cracking Mirando crude oil. The company expects to recover 60 per cent gasoline.

Officers of the company are: S. P. Coblenz, president; E. A. Sterling, vice president; E. A. Lynch, secretary and treasurer. Mr. Coblenz recently resigned as superintendent of the Misko Refinery at Mirando City to accept the position of president of the new company. E. A. Sterling is an oil operator in the Laredo district. J. F. Lynch was formerly manager of Camphuis & Company, customs brokers at Laredo.

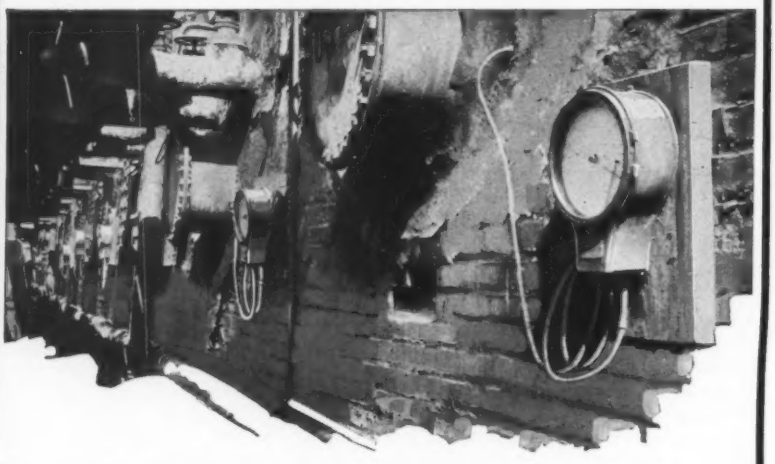
Wichita Falls Refinery Changes Name

Wichita Falls, Texas.—Wilson Brothers Refining Company, refiners and marketers of petroleum products, with a 2500-barrel capacity skimming plant at Wichita Falls, announces the change of the name of the company to Valley Refining Company. The adoption of a new name for the company does not involve a change in management. Eugene F. Griswold is president and manager of sales; R. A. Brollier, vice president and secretary; J. W. Mills, plant superintendent, and C. M. Zink, traffic manager.

Shell's Chicago Refinery Begins Operation

Chicago.—Roxana Petroleum Corporation's new 12,000-barrel refinery at Hammond, Ind., (Chicago), representing an expenditure of approximately $10,000,000, including the cost of the 240-mile extension of 8-inch line connecting Shell's main trunk line at St. Louis with the new plant, has started operations. It is through this 8-inch extension line that the refinery is to be supplied with Mid-Continent crude.

The output of the refinery will supply the retail market built up by Shell in the Chicago district, this part of Shell's territory having been formerly supplied by tank car shipments from the refinery at Wood River, near St. Louis. Due to the location of the Hammond refinery a great saving will be possible from the freight rate standpoint.



Bristol's are Built for the Refinery

Recording Instruments for oil refinery processes, aside from being sensitive and accurate, must also be rugged and fool-proof. Refinery engineers have enough to do without wasting time on faulty instruments.
That's why they specify Bristol's.

They Are Rugged

To prove this point, the illustration above shows Bristol's Recording Thermometers intended for indoor mounting, installed out-of-doors with no extra protection against the elements, yet faithfully performing their work day after day.

Simple Construction Makes Them Trouble-free

The pen arm and pressure element on Bristol's Gauges and Thermometers are connected directly. There is no complicated mechanism, hence, nothing to get out of order.
Longer service—fewer repairs.

The Bristol Company Waterbury, Connecticut
FOR 38 YEARS Ask Any Technical Engineer MAKERS OF
BRISTOL'S RECORDING INSTRUMENTS

SOUTHERN CORNICE WORKS

Manufacturers of

"SOCO" STATIONARY AND REVOLVING VENTILATORS

For Refinery
And Natural Gasoline Plants

Oil Field Work A Specialty

Phone 2-1546 TULSA, OKLAHOMA 118-20 S. Cincinnati

Standard of New York Buys Tankers

New York.—The Standard Oil Company of New York has purchased three steam tankers, each of 10,000 tons capacity, for intercoastal movement of crude and refined products to and from the Central Petroleum Corporation. Two of the additional tankers were acquired from the Sun Oil Company and one from Atlantic, Gulf and West Indies Steamship Company.

Empire Oil City Plant Being Improved

Oil City, Pa.—The Empire Oil Works, Inc., is enlarging its lubricating oil filter house at the Oil City plant. The improvements consist of the installation of six new large filters which will just double the present filtering capacity. A large building is being constructed adjacent to the filter house, which will house eight lubricating oil storage tanks. This entire building will be kept at an even warm temperature for the purpose of keeping the finished oil in storage in the tank house at the proper temperature for handling without the use of steam coils in the tanks proper. This practice will entirely eliminate the danger or possibility of contaminating the motor oil with water through leaking steam coils, etc. Storage under these conditions may be slightly more expensive than storage in steam boil heated tanks, but oils are kept in proper condition at all times without the use of steam, or without direct contact with the heating equipment.

A new batch lubricating oil still and condenser box, the unit having a capacity of 750 barrels, has recently been completed and put into operation.

The same company installed the Sharples type plant last year for the manufacture of lubricating oils. The new equipment is necessary to handle the increased production of motor oils.

Five Killed in Gas Line Explosion

Amarillo, Texas.—Five men were fatally burned March 16 by the explosion of a natural gas line near the Shamrock field, located in the eastern part of the Panhandle, while engaged in building a high pressure absorption gasoline plant for the Columbia Gasoline Corporation on the line. The victims follow: P. W. Melton, 53; Bob Griffin, 24; Leon Chance, 19, all of Shamrock; C. B. Belk, 30, Alba, Texas, and Roy A. Todd, 31, Hollis, Okla. Two other men working on the plant escaped with burns. The Columbian Gasoline Corporation is a subsidiary of the Columbian Carbon Company, Shreveport, La., and has contracted for the natural gasoline rights on gas delivered by the Northern Texas Utilities Company from the Shamrock field to Wichita Falls and intermediate points.

Extracts of Refining Technology

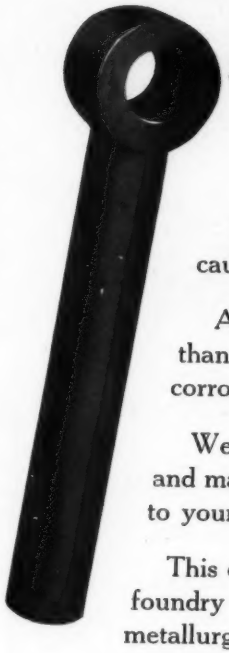
Reducing Sludge Formation in Lubricating Oils — The darkening and polymerizing of and the formation of sludge in oils such as lubricating or transformer oils, which are exposed at elevated temperatures to air, is reduced by the addition of organic substances, which are "capable of entering into molecular compounds or actuating secondary valencies." Such substances as aldehydes and their condensation products, bases, nitriles, oxamides acids and their derivatives or mixtures of these substances are employed for this purpose. In examples 1 per cent of trioxymethylene, 1 per cent of urea and 5 per cent of hexamethylenetetramine are added, respectively, to a motor oil, a high pressure compressor oil and a refined coal tar oil. (British Patent No. 262, 107. F. Hofmann and M. Kunkel).

* * *

Sulphur - Containing Compounds as Anti-Detonators—Distillation of the bituminous limestones of Raguse yields heavy fractions up to 350 degrees C boiling point, which may be used with satisfactory results in the internal combustion engine cylinder without producing detonation. This is due partly to the presence of a high proportion of hydrocarbons which have undergone a certain amount of degradation towards the unsaturated, cylic state, and partly to the presence of organic sulphur compounds. Since the atomic weights of the elements of the sixth group, and also the anti-detonating powers of their organic compounds, form approximate geometrical progressions, the anti-detonating powers of these sulphur compounds are evaluated. If they are present in the fraction to the proportion of 8 to 10 per cent, an anti-detonating power equivalent to 1-10 of 1 per cent of lead tetraethyl is produced. (Y. Altchidjian, Comptes rendues, 1926, volume 183, pages 975-8).

* * *

Analyzing Small Amounts of Lubricating Oils—The Vogel-Ossag viscosimeter has been designed for testing small samples of lubricating oils. The apparatus is essentially a modification of the Ostwald capillary viscosimeter, which is completely enclosed in a water bath, and it is so arranged that a whole viscosity curve, n against t, can be determined from one filling of 15 cubic centimeters of oil sample. This is accomplished by means of a pneumatic pump which is provided with the instrument. The results compare very favorably with those that are obtained by the older methods, but the apparatus is not satisfactory for testing dark or very viscous oils. A crucible is also described by the use of which reliable



Aluminum Bronze Studs

Large refiners buy these studs because they outlast the ordinary kind.

Aluminum Bronze is 250% stronger than ordinary bronzes. It is acid and corrosion resisting.

We will cast them as you want them and machine and thread them according to your specifications.

This company is distinguished for its foundry practice and knowledge of the metallurgy of non-ferrous alloys for exacting purposes. By casting to closer limits we save metal and money for our customers, providing a better product without increasing costs.

Send blue prints or data on your requirements.

Buffalo Bronze Die Cast Corporation
100 Arthur St. Buffalo, N. Y.

DBC

GOULDS PUMPS

Pumps for All Refinery and Gasoline Plant Services

Catalogs and Bulletins on request

GOULDS PUMPS, INC.
Seneca Falls, New York

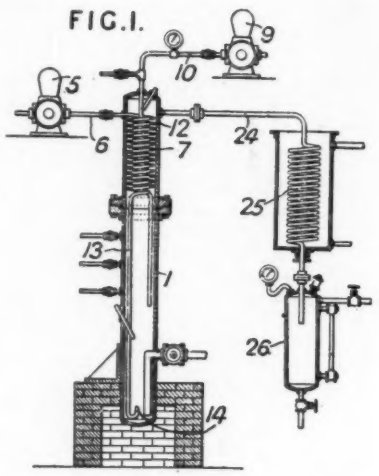
results for flash points and ignition points within the limits plus or minus 5 degrees C, are obtainable with only 10 cubic centimeters of the oil. (Zeitschrift fuer angewandte Chemie, volume 39, pages 1451-1454. G. Meyerheim and F. Frank).

* * *

Oxidized Products From Mineral Oil—The volatile oxygenation and disintegration products of crude petroleum and its distillates, shale oils, and tars, waxes, sludges, petroleum residues, asphaltic oils, asphalt, malthas, cracked oils and residues from cracking stills, wood tar oils and wood tar, peat and lignite distillates, coal tar oils and coal tars, and oils containing powdered coke, coal, or peats, sulphur, etc., in suspension, which may contain acids such as formic, acetic, propionic, butyric arylic and phthalic acids, aldehydes, such as acetaldehyde and propionaldehyde, ketonoes, such as acetone, and saturated and unsaturated alcohols, are utilized in the preparation of motor fuels. The fuel may contain only the water-insoluble products, the water-soluble products only, or a mixture of the two, and the water-soluble products may be treated with ammonia before being used.

In addition, the fuel may contain gasoline, a straight petroleum distillate, acetone, alcohol, benzol, water or a mixture of any two or more of these substances. Fuel so prepared may have a boiling point up to 400 degrees F to 500 degrees F, and they may contain a volatile water-solution product of oxidation which has a boiling point of 45 to 85 degrees C. Such fuels possess anti-knock properties in marked degree.

FIG. 1.



The oxidation of the oils may be carried out in the apparatus shown in the accompanying illustration which comprises a vertical still 1, condenser tube and coil 24 and 25, and receiver 26. Oil is supplied by the pump 5, pipe 6 and coil 12, and air by the pump 9, pipe 10, coil 7, and pipe 13 having at its lower end an upwardly directed nozzle 14 or a series of radically extending perforated pipes.

The process is carried out at a temperature of 600 to 900 degrees F. The pressure is about 300 pounds per square inch. Catalysts such as metallic oxides may be present and also neutralizing agents such as alkali carbonates. The distillate obtained is run into a wooden tank and separates on standing into layers which are separately removed and treated. (British Patent No. 257,886. W. B. D. Penniman).

* * *

Characteristic Gasoline Curves—The fractionation curves drawn for gasolines and other petroleum distillates depend largely on the character of the apparatus used in obtaining the experimental figures. The Engler apparatus gives different results than the Kraenner apparatus which is used in coke oven practice for testing benzols recovered from the by-product ovens. It appears therefore, to be very useful to devise a method whereby it might be possible to derive these curves by calculations.

For commercial purposes the progress of the distillation furnishes an important indication, particularly if the observations made at the point of ebulition and at the point where the material goes dry, which are but little accurate, by the measurement of the temperatures at which 5 and 95 per cent of the products by volume pass

Standard Specification Steam
Used Instead of Ordinary Steam
Reduces Operating Cost

The
TRACYFIER

Assures the Continuous Delivery of Standard Specification Steam

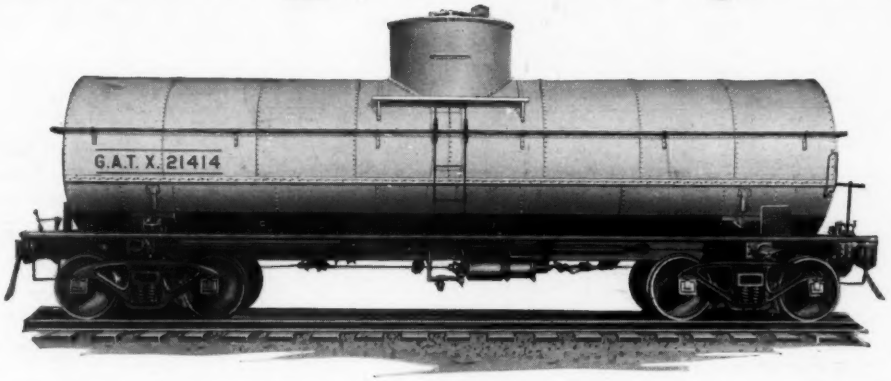
CLEAN STEAM TRACYFIER DRY STEAM
Trade Mark

Which of these Bulletins shall we send you?

( ) No. 40 Certified Savings due to the use of Standard Specification Steam.
( ) No. 39 Standard Specifications for Clean and Dry Steam.
( ) No. 37 What happens when you don't have Standard Specification Steam.
( ) No. 36 Concentration in Boilers.
( ) No. 34 The Tracyfier in Cement Plants.
( ) No. 32 The Physical Side of Concentration in Boilers.
( ) No. 28 Blowing Down a Boiler through the Steam Nozzle.
( ) No. 24 Amount of Savings by Using Standard Specification Steam in an Oil Refinery.

Andrews-Bradshaw Company
533 Fourth Avenue Pittsburgh, Penna.

EFFICIENT DEPENDABLE SERVICE



TANK CARS *of* ALL CLASSES BUILT *and* LEASED

For the TRANSPORTATION of LIQUID COMMODITIES

GENERAL AMERICAN TANK CAR CORPORATION

General Offices: ILLINOIS MERCHANTS BANK BLDG., CHICAGO, ILL.

BRANCH OFFICES:

Eastern Offices: 17 Battery Place, New York; Munsey Building, Washington, D. C.

Midwestern Offices: 1946 Railway Exchange, St. Louis, Mo.; 502 Cosden Bldg., Tulsa, Okla.

Southern Offices: Union Indemnity Bldg., New Orleans La.; Magnolia Bldg., Dallas, Texas

Pacific Coast Office Bartlett Bldg., Los Angeles, California

PLANTS: EAST CHICAGO, IND. GOOD HOPE, LA. WARREN, OHIO FORT WORTH, TEXAS SAND SPRINGS, OKLA. WICHITA FALLS, TEXAS

REPAIRING DONE AND REPAIR PARTS CARRIED IN STOCK AT ALL PLANTS

Acid Proof!

Liquids and gases of a corrosive nature are readily handled with

EVERDUR FITTINGS

Send for Bulletin 7-E describing these fittings and the Jets and Valves made of this corrosion-resisting metal.

SCHUTTE & KOERTING CO., 1253 N. 12th Street, PHILADELPHIA, PA.

over. This is a method employed in studying the benzols.

In order to obtain a more representative result the author has proposed the determination of an index or co-efficient, by adding the temperatures at 5, 15, etc., prevent volume distilled and dividing the sum by 10.

This co-efficient is particularly advantageous in testing mixtures where the curves of the constituents do not afford an exact idea of the final combined curve of the entire mixture. It has been found true that the index or co-efficient of a mixture, which has been calculated from the co-efficients of the various constituent parts of the mixture correspond very closely to the actual co-efficient of that mixture. It should be mentioned that the method is, however, inapplicable to those cases where one ingredient of the mixture acts on the other and thus modifies its boiling point, as in the mixture of alcohol and benzol. Further details are obtainable in the article by W. Ostwald, Petroleum Zeitschrift 1926, pages 678-679.

* * *

Improvement in Cracking Process—The process, which is patented by the V. L. Oil Process, Ltd., in French Patent No. 599,311, consists in the extraction of the light products, that is the products with low boiling points, as they are being formed, the operating of removal being continuous. The process is thus carried out under conditions of temperature and pressure which allow continuous cracking of the mass of heavy oils. The products that are removed from the cracking apparatus are in the form of gases, light oils and heavy oils. The mixture is led through a chamber which is provided with a reflux condenser and is maintained at a temperature 200 degrees C lower than that of the cracking chamber, so that only the heavy oil is condensed.

The products of condensation are cooled and they form a second cycle in the cracking process. The fresh oil and the oil treated in the above manner, are then introduced together into the mass which is maintained at the cracking temperature, that is between 450 to 550 degrees C, the pressure being from 42 to 70 kilograms per square centimeter. The yield of light oils obtained from the cracking of heavy oils in a single operation was found to be 40 per cent.

* * *

Cracking of Ozocerite—The cracking of ozocerite in the presence of 5 per cent of anhydrous aluminum chloride, which acts as a catalyst, yields products which distill at approximately 160 degrees C. These products contain approximately 6 per cent of benzine and 19 per cent of petroleum oil. With 15 per cent of the catalyst present, the distillation commences at a temperature of 122 to 125 degrees C, the distillate containing 30 per cent of benzine, and 5 per cent of petroleum oil, with 25 per cent of the catalyst present, the distillate, which first comes over at a temperature of 110 degrees C, contains 7 per cent of benzine and 2 per cent of petroleum oil. In the last two cases large quantities of gas were evolved and in all cases unsaturated hydrocarbons were produced. Bull Soc., Romana Stiinite, volume 29, pages 3 to 5. E. Toporescu.

* * *

Artificial Aging of Mineral Oils—When a transformer oil is heated at a temperature of 150 degrees C in an atmosphere of oxygen, changes take place similar to those occurring over the course of years of use. These changes may be accelerated by dispersing the oil on silica gel previously impregnated with an oxide catalyst. The rate of oxidation of the oil is dependent on the chemical and physical nature of the catalyst, the most efficient being colloidal oxides of multivalent metals such as vanadium, molybdenum, or tungsten in combinations with ferric oxide. The relative stabilities of various oils may be compared by determining the rate of oxidation under standard conditions, for example, heating for two hours at a temperature of 150 degrees C, followed by a determination of the acid value of the oxidized oil. The rate of oxidation is usually very great during the first five minutes heating, but subsequently it decreases rapidly, finally becoming stationary in one to two hours. During oxidation small amounts of carbon dioxide, carbon monoxide, methane and hydrogen are formed. F. Evers and R. Schmidt in Wiss. Veroeff. Siemens-Konz., volume 5, pages 210-228.

Texas Clay Products Co.,
Malakoff, Texas

Elgin Butler Brick Co.,
Austin, Texas

Acme Brick Co.,
Ft. Worth, Texas

Athens Brick & Tile Co.,
Athens, Texas

Refiners of the Southwest pay less

Quality Equal to 85% of Fire Brick Uses

A high quality fire brick with a low, local freight rate! That's why Refiners of the Southwest use Texas Fire Brick. Get the grade you require at the price you desire, use

TEXAS FIRE BRICK

Other Economies: We often find customers using higher grade brick than is needed. Tell us your needs; it may be we can effect still greater economy for you.

Write Any Member Listed

Texas Fire Brick Mfgrs. Assn.

Promoting Texas Fire Brick Economies

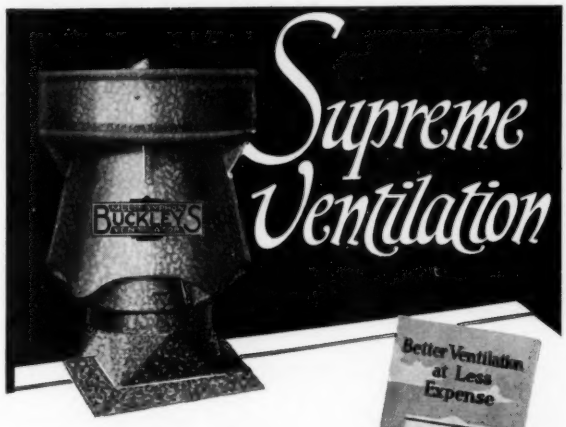
BUCKLEY'S

MULTI-SYPHON

VENTILATORS

Are now being used throughout the United States and five foreign countries in **serving the oil industry.**

There's A Reason!



"BETTER VENTILATION AT LESS EXPENSE,"

which gives you full details as to construction, theory, material, capacities, weights and prices.

Write for catalogue.

Manufactured only by

The American Cornice Works Co.

Wichita, Kansas

HYTEMPITE

(Reg. U. S. Pat. Off.)

JOINTS MAKE A SOLID FIREBRICK WALL—NO SHRINKAGE—NO CRACKS—NO LEAKS

Brickwork bonded with HYTEMPITE, using the thin brick-to-brick joint, doesn't depend on heat for adhesion. It air sets and the strength of the bond is increased by heat up to temperatures at which the best quality of firebrick will soften or fail. HYTEMPITE has approximately the same coefficient of expansion as the material it bonds.

SPEED YOUR FURNACE REPAIRS WITH THE QUIGLEY REFRACTORY GUN

The Quigley Gun shoots premixed refractory materials with great velocity at any place in wall or arch of furnace. It makes the material stick where hand troweled or rammed-in applications might fail to hold. Patches hot walls—saves shutdowns.

Use Crushed Old Firebrick or Ganisand mixed with HYTEMPITE for best results on furnace maintenance.

Quigley Furnace Specialties Co., Inc.

26 Cortlandt St., New York City

Distributors with stock and service in every industrial city.

RECENT REFINERY PATENTS

BY STAFF REPRESENTATIVE

Washington, D. C.—The following patents of interest to the refining industry have been granted by the United States Patent Office:

No. 1,618,427, granted February 22, to Emanuel W. Hartman, Los Angeles assignor to Hartman Interests, Inc., Los Angeles, for a crude oil cracking apparatus comprising a still in which the oil to be cracked is heated, coils in which the oil passing from said still is superheated, a pump, a nozzle through which the oil from said coils is forced by said pump, a retort into which said nozzle opens, a collecting chamber, pipes connecting said chamber with said still and said retort through which the gasoline carrying gases cracked from the treated oil pass, a furnace enclosing said still, coils, retort, and pipes and means in said furnace for heating the enclosed parts.

No. 1,618,645, granted February 22, to Gustav Egloff and Harry P. Benner, Chicago, assignors to Universal Oil Products Company, Chicago, for an apparatus for treating oil, including combination with a still having a stationary portion and a movable portion of means for actuating said movable portion and a heating element taking the form of a longitudinally disposed tube extending through said portions, and oil feed passing through the stationary portion, and vapor and residium outlets in said stationary portion.

No. 1,618,669, granted February 22, to Jacques C. Morrell, Chicago, assignor to Universal Oil Products Company, Chicago, for a process for treating petroleum residue comprising subjecting cracked liquid petroleum residue containing suspended pitch-forming, coke-like particles to a segregating action to separate the suspended particles from the liquid medium, in separately withdrawing the precipatated particles with accompanying only liquid and subjecting same to a homogenizing action whereby the suspended particles are substantially stabilized and the mixture assumes a creamy consistency.

No. 1,619,074, granted March 1, to Herbert L. Johnson, Brooklyn, N. Y., assignor to Standard Development Company of Delaware, for a lubricant which comprises a mineral lubricating oil containing a water-soluble sulfonic compound derived from mineral oils and a non-mineral oleaginous vehicle.

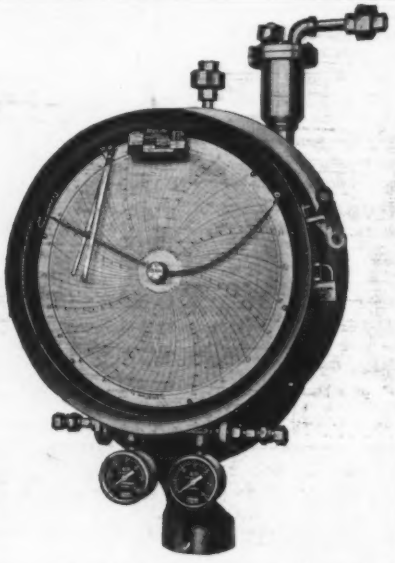
No. 1,619,206, granted March 1, to Meade W. Harringer and William J. Baker, Tylersburg, Pa., for an apparatus for extracting wild gas from casing head gasoline, comprising a plurality of parallel pipes located in vertically spaced relation to each other and each sloping downwardly from the horizontal at an agle such that the total drop from the intake end to the outlet end is substantially 5¾ inches in 107 inches, a plurality of vertical headers each having a considerably greater internal diameter than the sum of the internal diameters of said pipes, the first of said headers being connected with all of said pipes at one end and the last of said headers being connected with all of said pipes at the other end, while all of the pipes open into each intermediate header, a gasoline intake pipe opening into the first header, a vapor outlet at the top of each header for the release of wild gas, a gasoline outlet at the bottom of certain of said headers, means for heating said pipes and headers to such temperature as will vaporize the wild gas in the gasoline flowing therethrough, and a residue gas container located above said sloping pipes and said headers and receiving the vapor from the vapor outlets in said headers, said container having an opening at its bottom leading into the first

Foxboro

Volume Controllers

are needed at

SEMINOLE



"Air Lift increases yield at Seminole," writes the OIL AND GAS JOURNAL. Air lift has proved successful while production is still in the flush stage. Many compressors are already operating and many more are ready for installation.

Future production may largely depend upon how this important process is controlled.

The Foxboro Automatic Volume Controller has been especially designed for this important work. It properly proportions the volume of gas or air to the well. By performing this function perfectly many advantages result: more production from the well—a saving in labor costs—often a saving in the number of compressors used.

This instrument is the well-known Foxboro Orifice Meter combined with the equally well-known Foxboro Automatic Controller, successfully used for more than ten years.

The Foxboro Automatic Volume Controller is needed at Seminole. For further details get in touch with our nearest branch office.

THE FOXBORO CO., INC.

Neponset Avenue, Foxboro, Mass., U. S. A.
205 So. Cheyenne Avenue, Tulsa, Okla.

New York Chicago Boston Philadelphia Pittsburgh
Cleveland Rochester Atlanta Los Angeles
Detroit San Francisco Portland, Ore

FOXBORO

REG. U.S. PAT. OFF.

THE COMPASS OF INDUSTRY

York Mechanical Refrigeration
is *dependable* Refrigeration

Designed, built, installed and *guaranteed* by the world's largest organization of Refrigerating Engineers

Write for our bulletins

YORK Manufacturing Company

Ice Making and Refrigerating Machinery Exclusively

York, Penna.

WALSH FIRE BRICK

FROM COAST TO COAST

WALSH FIRE CLAY PRODUCTS CO.

ST. LOUIS

CHICAGO

360 N. MICH. BL.

NEW YORK

220 FIFTH AVE.

Rely on
METALLO
GASKETS

WHAT proportion of the leaks, blowouts, shutdowns, waste and repairs on your high pressure, high temperature lines is due to gasket failure? Let your next gasket be a METALLO, made of finest 14-oz. copper shaped into deep corrugations, each interlaid with high-grade closely woven asbestos cord, each corrugation a tight gasket in itself.

METALLO Refinery Type Gaskets of double-jacketed corrugated steel and asbestos filled, hold on 900 lbs. and 1112 deg. F. All sizes for oils, chemicals and acids.

METALLO VALVE DISCS—copper jacket completely enclosing a filler of heavy compressed asbestos packing—an elastic, resilient cushion on which valve seats close snugly. Try them for 90 days free.

Write for copy of new Metallo Catalogue—handsomely illustrated.

Metallo Gasket Company
New Brunswick, N. J.

MARLEY - SPRAY PONDS

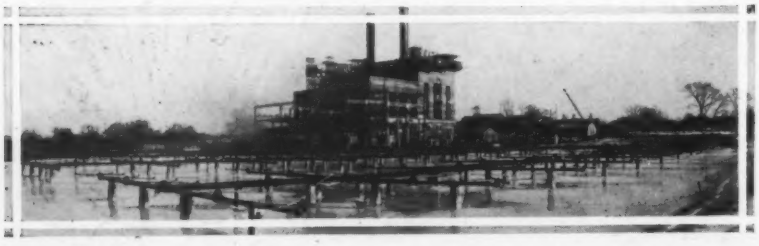
MOST of the major spray ponds installed in the Southwest during the past several years have been designed by Marley. This is indicative of the faith that is placed in Marley engineers, and is because of their reputation for designing successful spray ponds. It will pay you, too, to counsel with Marley engineers on your spray pond and spray cooling equipment needs. This will be done gladly without obligation.

SPRAY COOLING EQUIPMENT, TOO

Marley Spray Cooling Equipment too, is a leader. Makes possible lower operating pressure, reduced friction, decreased pumping cost, and less cost for labor and material to install. Many in use throughout the country. Better send for our catalog.

Write for Catalog

POWER PLANT EQUIPMENT, KANSAS CITY, MO.



of said headers to return to the sloping pipes any liquid gasoline which escapes with the wild gas.

No. 1,619,284, granted March 1, to John E. Bell, Brooklyn, N. Y., assignor to Sinclair Refining Company, Chicago, for an improved method of cooling and condensing distillate vapors from oil stills, which comprises bringing the hot vapors escaping from the still into indirect heat exchanging relation with a relatively small volume of water maintained at its boiling point and vaporizing the water, passing a current of air in contact with said water to aid vaporization, and further cooling and condensing the distillate vapors by heat exchange with a relatively large volume of cooling water without substantial vaporization thereof.

No. 1,619,348, granted March 1, to Gustav A. Kramer, Concord, Cal., assignor by mesne assignment to Simplex Refining Company, San Francisco, for a process of treating mineral oils which comprises producing a mixture of vapors from a suitable charging stock under a low absolute pressure; cooling said mixture of vapors to a sufficient degree to condense therefrom a certain portion thereof; increasing the absolute pressure on the remaining vapors to a value which is still considerably less than atmospheric pressure; and subjecting said remaining vapors to a further condensation.

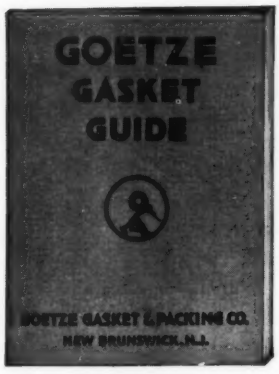
No. 1,619,352, granted March 1, to James McKee, Chester, Pa., assignor to Sun Oil Company, Philadelphia, for a process of making grease which contains a predominating proportion of mineral oil together with a lime-saponified fatty acid, which comprises forming a mixture of calcium hydrate with a minor proportion of the mineral oil, heating the mixture to expel moisture, cooling, and adding a fatty acid, a small percentage of water and the remainder of the mineral oil and heating to about 200 degrees to 240 degrees F.

No. 1,619,396, granted March 1, to John E. Bell, Brooklyn, N. Y., assignor to Sinclair Refining Company, Chicago, for a process of fractioinal distillation and condensation of oil comprising flowing the oil to be treated through a series of stills heated to successively higher vaporizing temperatures, heating the feed oil to each still by vapors from the same still, withdrawing the resulting condensate and heating each still by the remaining uncondensed vapors from the still at next higher temperature.

No. 1,619,440, granted March 1, to Alfred J. Sloan, Kansas City, Kan., assignor to Sinclair Refining Company, Chicago, for a pressure still for cracking hydrocarbons, having a condenser maintained at a lower pressure than the pressure in the still, a vapor line leading from the still to the condenser, a pressure reducing valve in the vapor line, and a by-pass around this valve which includes an automatic self-contained relief valve.

No. 1,619,525, granted March 1, to

GOETZE

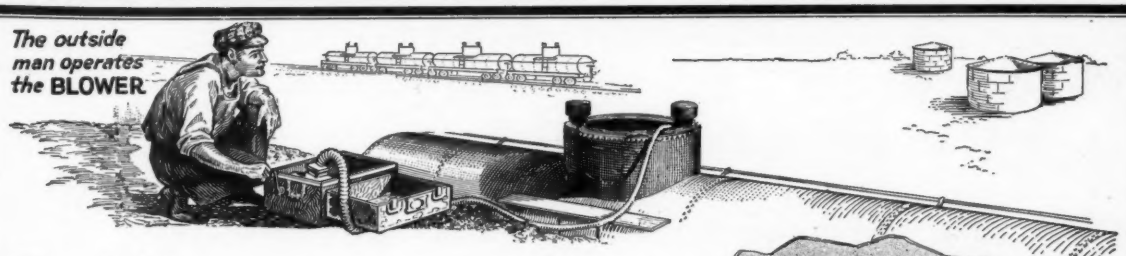


Metal-Asbestos Gaskets
for
Modern Refinery Practice

Write for this 36-page "Guide"

Goetze Gasket & Packing Co.

28 Allen Ave., **New Brunswick, N. Y.**



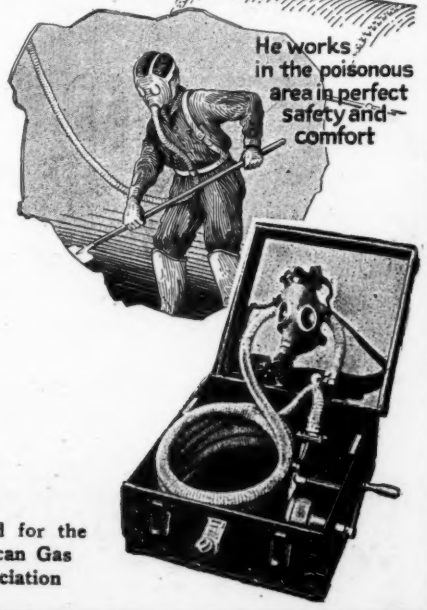
Feed him
FRESH-COOL-AIR

—and he'll work with greater ease, comfort and safety.

The M-S-A Standard
HOSE MASK

Supplies a continuous stream of fresh air to workers in Tank Cars, Oil Tanks, or in any confined gaseous space.

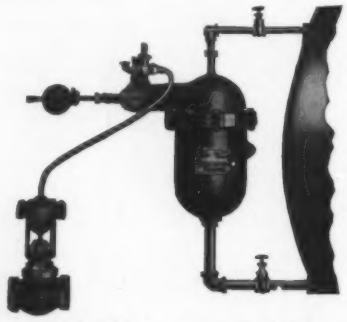
Send for Bulletin No. 99F for complete information on this and other types of Hose Masks



Mine Safety Appliances Co.

Braddock Ave & Thomas Blvd. Pittsburgh, Pa.

Standard for the American Gas Association



Dependable — Of Course

The Vigilant Liquid Level Regulator, by remote control, is designed to maintain a constant oil level in both the absorbing tank and the still, where gas line is manufactured by absorbing the gasoline in oil and subsequently separating it from the oil by distillation.

This regulator will accommodate itself to any type of absorber or steam still, and maintain a constant oil level under all conditions of temperature and pressure.

Thirty-five years of successful experience in the manufacture of regulators assure to the purchaser absolutely accurate and reliable equipment.

Write for catalogue.

Chaplin-Fulton Mfg. Company
28-36 Penn Ave. Pittsburgh, Pa.

For Protection

When paint spraying outside work use the New Improved Pulmosan Dustproof Aluminum Respirator.

For painting inside of tanks and tank cars use the Pulmosan Airline Mask with blower attachment.

Write for Descriptive Literature

Pulmosan Safety Equipment Corp.
384 Jay Street Brooklyn, N. Y.

Howard E. Marsh, Lompoc, and Charles J. Dunten, Santa Maria, Cal., assignors of one-sixth to Verner B. Lee, Santa Barbara, Cal., and one-sixth to James H. Lee, Grand Junction, Colo., for an oil-shale apparatus comprising a boiler, means to heat the boiler, a shale chamber in said boiler, means for firing the shale chamber, a feed duct leading to the upper end of the shale the shale chamber, a vapor chamber communicating with the shale chamber, a seperator connected with the vapor chamber, an exhauster communicating with the separator, and means operated by steam from the boiler to drive the exhauster.

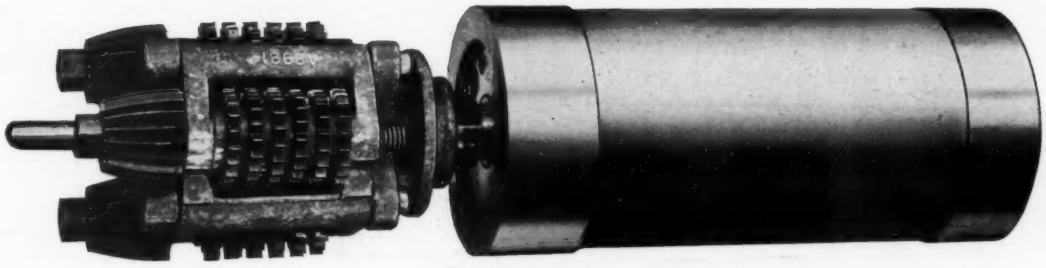
No. 1,619,869, granted March 8, to Lloyd E. Jackson, Pittsburgh, Pa., for a method of removing from a mineral hydrocarbon oil a fatty-acid impurity together with foreign matter in suspension, which consists in adding to the material to be treated a measured quantity of alkali in aqueous solution, sufficient to neutralize the fatty acid present, with a margin of excess not exceeing 10 per cent of the amount required to effect exact neutralization, allowing the consequent precipitate to settle carrying with it into sediment the foreign matter in suspension, and separating from such sediment the purified oil.

No. 1,619,896, granted March 8, to Walter Edwin Trent, Washington, D. C., assignor to Trent Process Corporation, New York, for a process of oil conversion, consisting in passing charging stock through a heat interchanger where a portion thereof is vaporized, in subjecting said heated vapors to a compression sufficient to raise the same to a cracking temperature, and in passing said vapors to said heat interchanger to supply heat to vaporize the charging stock.

No. 1,619,921, granted March 8, to Gustav Egloff, Chicago, assignor to Universal Oil Products Company, Chicago, for a process of cracking oil, consisting in passing the oil through a heating zone where it is subjected to the action of heat and pressure, delivering it thorugh a transfer line in substantially liquid form to an expansion chamber where vaporization takes place, taking off the vapors from the end of the expansion chamber remote from its connection with the transfer line, subjecting such vapors to reflux condensation and returning the reflux condensate to said transfer line, where it is mixed with the heated oil and the combined mixture then passed to the expansion chamber.

No. 1,619,922, granted March 8, to Gustav Egloff and Harry P. Benner, Chicago, assignors to Universal Oil Products Company, Chicago, for an apparatus for treating oil consisting, in combination with a rotating still member having a non-rotating part, of a vapor chamber having a main rotating part and a non-rotating part connected therewith, means connecting said still

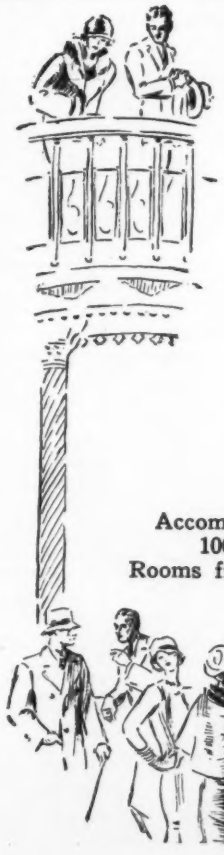
ROTO TUBE CLEANERS



Roto Air-Driven Heavy Duty Cleaner
For

CRACKING STILLS

THE ROTO CO. **Sussex Avenue and Newark St.,** **NEWARK, N. J.**



Great Northern
Hotel
CHICAGO

Jackson Blvd., Dearborn and Quincy Sts.

The "Comfortable Great Northern" is conveniently located in the shopping and theater district, two squares from the financial center and just a short walk from the wholesale section.

Accommodations for
1000 persons
Rooms from $2.50 a day

Here at rates considerably moderate are large, bright, livable rooms, excellent service and the conservation environment of a substantial business institution patronized by leading, conservative environment of a substantial distinguished guests with their families.

Throughout all departments, including the famously good restaurants, considerate moderation of charges prevails.

Mention Where You Saw the Advertisement

ASK ANY OF OUR LESSEES ABOUT CONLEY CARS

Our Equipment is in First Class Mechanical Condition

Cars for Gasoline, Fuel Oil, Lubricating Oils
Insulated Cars for Natural Gasoline

CONLEY TANK CAR COMPANY

Magnolia Bldg. DALLAS, TEXAS (*Write or Wire Our Nearest Office*) Oliver Bldg. PITTSBURGH, PA.

A Modern Publishing Establishment

Our equipment is especially adapted to the publishing of books on petroleum, oil field supply catalogues, oil company house organs, booklets, etc.

Give us an opportunity to figure on your next printing job.

The Gulf Publishing Company
Dallas Avenue at Chenevert Street
Houston, Texas

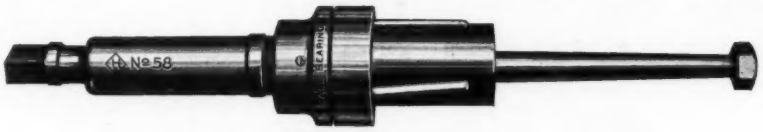
and said vapor chamber, whereby they rotate in unison, an oil inlet to sand still, a residium discharge from the non-rotating part thereof, a vapor discharge from said still leading outwardly therefrom through the non-rotating part and entering said vapor chamber through an opening in the stationary part thereof for transferring the vapors from the still to the vapor chamber, and means for discharging vapors from the stationary part of the vapor chamber.

No. 1,619,929, granted March 8, to Hiram J. Halle, New York, assignor to Universal Oil Products Company, Chicago, for an apparatus for cracking petroleum oil consisting, in combination with a coil located in a furnace through which oil is continuously passed, of a second coil disposed within said oil coil forming an annular oil passageway, spirally arranged spacing lugs carried by said second coil, to space the same from the oil coil and act as baffles for the oil passing through said annular passageway, a flue leading from the furnace, means for withdrawing heated gases from said flue to be passed through said second coil to internally heat the oil passing through said annular passageway.

No. 1,619,977, granted March 8, to Lyman C. Huff, Chicago, assignor to Universal Oil Products Company, Chicago, for a process for treating hydrocarbon oil consisting in passing the oil in a plurality of streams during its initial flow through a heating zone and while being subjected to preliminary heating therein, in thereafter increasing the velocity of the oil during a substantial portion of its flow through the heating zone by uniting said streams prior to the final heating of the oil in the heating zone.

No. 1,620,075, granted March 8, to John Collins Clancy, Asbury Park, N. J., for a process of converting higher boiling oils into lower boiling oils, comprising the combination of steps which include introducing a stream of a mixture of such higher boiling oils and aluminum chlorid into the upper end of a sealed retort having a portion thereof maintained at a temperature to effect an oil cracking reaction therein, delivering into contact with the said oil mixture a stream of a metal chlorid which is capable of holding in suspension a portion at least of the carbon separated out in said reaction, the said metal chlorid being in molten condition, preventing the accumulation of carbon deposits in the retort by allowing said molten chlorid containing such suspended carbon and the unvaporized oil, carrying its quota of separated carbon in suspension, to discharge from the retort, and collecting the evolved vapors of lower boiling oils and aluminum chlorid; and, in a process of producing low boiling oils from chlorid sludges resulting from the distillation of high boiling oils with aluminum chlorid the step comprising, contacting and commingling said chlorid sludges with a

HEAVY DUTY EXPANDERS FOR STILL TUBES



TOOLS FOR THE OIL INDUSTRIES

Hydraulic Pressure Pumps, 8000 pounds
Tube Expanders for Cracking Still Tubes
Hydraulic Pressure Pumps, 2000 pounds.
Tube Expanders for Condenser Tubes
Hydraulic Pressure Pumps, 500 pounds.
Tube Expanders for Steam Boilers
Screw Punches for Structural Shapes
Tube Expanders for Pipe Work
Screw Punches for Plate Work
Flaring Tools for Still Tubes
Beading Tools for Still Tubes
Hydraulic Jacks
Hydraulic Punches

A. L. Henderer's Sons

Wilmington, Del.

Established 1870 Expanders since 1884

Standard Type
¾" EMPIRE

EMPIRE

OSCILLATING PISTON
OIL METERS

So simple. Merely pipe the oil through the meter, and read off the amount registered plainly on the dial face. Nothing superior for pressure still work or other refinery needs.

EMPIRE meters are really "different", because by means of a simple and inexpensive adjustment they can be kept right up to their original high efficiency for remarkably long periods of hard service. This lasting accuracy is an outstanding and exclusive feature of the EMPIRE.

The Empire is a strong and durable meter. The design is simple, and all parts substantial. This means long life and low repair cost—two points for which the EMPIRE has held an unbeaten record for over forty years.

Send for fully illustrated catalog 110-R.

NATIONAL METER COMPANY

299 Broadway, New York

Chicago Boston Cincinnati Atlanta San Francisco Los Angeles

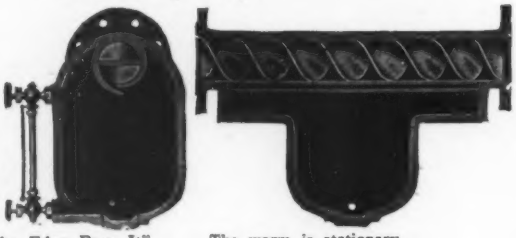
Mosher Separators

For Steam, Gas or Vapor Lines

are used by leading Refiners, Gasoline Plants and Gas Companies

Centrifugal
Positive
Quick

In all sizes 1" to 20". Also vertical and angle types.



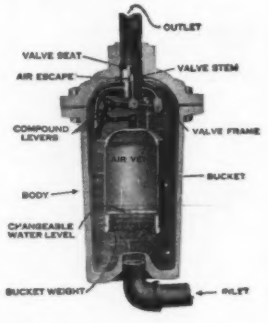
"The Whirl and the Edge Does It" 99.7% Perfect Results

The worm is stationary No revolving parts

DRAINED with
ARMSTRONG TRAPS
which cannot waste steam or become gas bound and are self-scrubbing.

Dallas Stock

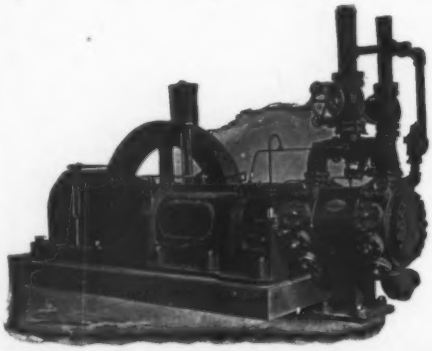
GEO. B. ALLAN & CO.
Simpson Bldg.—Dallas, Texas



Kelly Self-Grinding Valves in Stock.
Eckenroth Self-Grinding Blow-Off Valves.
Cash "Standard" Reducing and Regulating Valves.
McGregor Double Pump Valves, formerly called "WEMCO."
Campbell Boiler Feed-Water Regulators, easiest installed and most dependable
Campbell Steam Flow Controller and Recorder
Cadman "Gato" Plug Valves (Dallas Stock)
Vulcan Soot Blowers for Boilers, Oil Heaters, and Pipe Stills

Vilter Ammonia Compressors Fittings and Pipe Coils

Render Years of Reliable Service



Compressors built in several types and a great variety of sizes. Illustration is of a high speed type compressor.

Complete Data on Request

THE VILTER MFG. CO.
Established 1867
1152-1162 Clinton St. Milwaukee, Wis.

BRANCH OFFICE
413 Com'l Bank Bldg.
Houston, Texas

molten mixture of sodium chlorid and zinc chlorid in the presence of hydrogen while said molten mixture is circulating through and into contact with an intersticed mass of nickel packing units a portion at least of the latter being maintained at cracking temperature.

No. 1,620,095, granted March 8, to Ford W. Harris, Los Angeles, Calf., for an oil and gas separator comprising walls forming a separating chamber; means for introducing an oil and gas mixture into said separating chamber; walls forming a control piston chamber with the upper end of said piston chamber; an oil conduit connecting the lower portion of said separating chamber with the lower end of said piston chamber; a gas delivery port opening from the upper end of the bearing surface of said piston chamber, and an oil delivery port opening from the lower end of the bearing surface of said piston chamber; and a piston slidably disposed in said piston chamber and adapted in its up position to close said gas delivery port and in its down position to close said oil delivery port.

No. 1,620,163, granted March 8, to Frank A. Milliff and John A. Milliff, Los Angeles, Cal., for a process of refining petroleum comprising applying heat to the petroleum to drive off hydrocarbon vapors therefrom; cooling the mixture of vapors thus formed to a predetermined temperature; causing said vapor mixture to suddenly expand and rotate at an eccelerating speed over a given distance to separate out condensate formed by cooling the vapor mixture; collecting said condensate; and causing said vapor mixture to impose a partial vacuum upon said condensate which communicates with said vapor mixture.

No. 1,620,771, granted March 15, to David G. Lorraine, Los Angeles, Cal., for an oil and gas separator comprising a settling chamber, a gas chamber, a discharge from said settling chamber, a valvular control for said discharge at the exterior of the device, a gas discharge inside of said gas chamber, a valvular control for said gas discharge inside of said gas chamber, a float movable in accordance with the level of a flow relative to the device, and operating connections between the float and the respective valvular controls.

No. 1,621,071, granted March 15, to Willard Duglas Kinkade and Charles Joel Baugh, Barnsdall, Okla., for a process of treating acid sludge to provide a fuel which comprises adding acid sludge from petroleum refining to a fuel oil, heating the same sufficiently to reduce the viscosity, mixing with amounts of soda and lime far less than the amounts thereof which would be necessary for neutralization of the acidity of the sludge, and well agitating the mixture, whereby an oil mixture suitable for use as a fuel is produced.

No. 1,621,229, granted March 15, to David Moyes Allan, Halifax, Nova Scotia, Canada, assignor to Standard

SEAMLESS STEEL STILL TUBES

Thousands of Babcock & Wilcox open hearth seamless steel still tubes are in service in refineries throughout the country.

These tubes have been supplied to various specifications, either with plain ends or upset as ordered.

Many of them are thirty feet long, made hot finished by a process perfected by this Company, for tubes of unusually long length.

The more common sizes are carried in stock at the Mill for immediate shipment.

THE BABCOCK & WILCOX TUBE CO

Works: Beaver Falls, Pa.

General Sales Office: 85 Liberty Street, New York

BRANCH OFFICES

CHICAGO .....Marquette Building
BOSTON .....80 Federal Street
PHILADELPHIA ..... Packard Building
PITTSBURGH ...Farmers Deposit Bank Building
CLEVELAND .....Guardian Building
CINCINNATI .....Traction Building
ATLANTA, GA. .....Candler Building
NEW ORLEANS .....344 Camp Street
HOUSTON, TEXAS.....Electric Building
SAN ANTONIO, TEXAS .....
.....511 Builders Exchange Building
DALLAS, TEXAS .....Magnolia Building

BRANCH OFFICES

GALVESTON, TEXAS .....414 Security Building
AMARILLO, TEXAS, ...208 Polk Street
PHOENIX, ARIZONA.....Heard Building
DENVER .....444 Seventeenth Street
SALT LAKE CITY .....Kearns Building
SEATTLE .....L. C. Smith Building
SAN FRANCISCO .....Sheldon Building
LOS ANGELES .....Central Building
PORTLAND, OREGON .....Gasco Building
HAVANA, CUBA .....Calle de Aguiar 104
SAN JUAN, PORTO RICO ..Royal Bank Building
HONOLULU, H. T.....Castle & Cooke Building

RUBSHELL PAINTS

Recent experiments show the following:

Where strong acid conditions prevail use one coat Rubshell Priming and two coats Rubshell No. 2.

Where Hydrogen Sulphide is present and on under side of roofs of crude oil tanks use Rubshell Priming with Rubshell No. 4.

In Gasoline tanks also in condenser boxes containing hot salt water use Rubshell Priming with Rubshell No. 1.

Sole Manufacturers

International Compositions Co., Inc.

25 Broadway, New York

Agent for Texas: J. A. ROSSITER COMPANY
410 Union National Bank Bldg., Houston, Texas

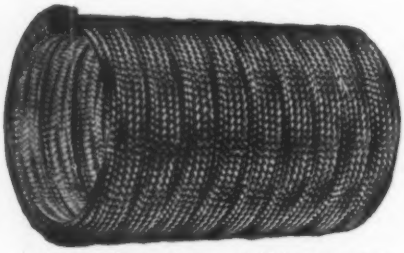
"John Crane"

METALLIC PACKING

New Style 250

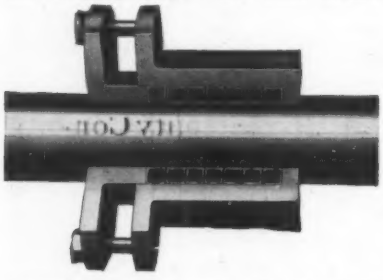
Air or Gas Lift Compressors

On compressors, 1600 lbs. pressure handling temperatures 800° to 900° F., this braided copper jacket with new Craneum mixture center had delivered the goods where pure asbestos packings have lasted only a few days.

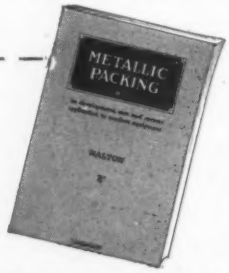


Craneum is a mixture of high temperature materials and firely divided metal particles mixed with graphite and suitable binder.

Operators of gas compressors having hot rods or experiencing scored rods should order this packing at once, if they desire continuous operation of their wells. Has also proven extremely successful handling hot oils against pressure of 1600 lbs. and temperatures ranging 900° F. as found in crack ng.



12 ft. spirals ¾ to 1¼ inches. Investigate!



Crane Packing Company
1819 Cuyler Ave.
Chicago, Ill.

Kindly send your 136 page text book, "Metallic Packing," with special data on refinery service. No obligation.

Name .....

Address .....

Title .....

Development Company of Delaware, for an apparatus for the distillation of oil consisting of a still, an expansion chamber, a vapor line passing from the still to the expansion chamber, means for returning condensate from the expansion chamber to the still, means for heating moisture containing oil by the vapors before they proceed to the expansion chamber, and means for feeding the heated moisture-containing oil into said expansion chamber.

No. 1,621 298, granted March 15, to George D. White, Port Arthur, Texas, assignor to The Texas Company, New York, for an apparatus for cracking hydrocarbon oils comprising a battery of spaced vertical stills, a furnace chamber disposed about said stills the walls of which chambers are spaced from the stills, a plurality of gas burners extending through opposite walls of said furnace and spaced from each other horizontally and vertically at points intermediate the several stills, the ar-arrangement being such that heat is applied at a plurality of distributed points within the furnace in such a manner as to avoid direct contact of the flames against the still walls whereby hot spots are prevented, and a plurality of flue passages spaced from each other in the upper part of the furnace whereby the furnace gases are caused to travel upwardly through the furnace and are withdrawn at distributed points in the upper part thereof.

No. 1.621.475, granted March 15, to Walter M. Cross, Kansas City, Mo., for a continuous process for treating petroleum hydrocarbons, consisting in combining the oil with an acid to form an intimate mixture, limiting the period of contact to a predetermined length of time approximately one-half minute to prevent polymerization of the oil, separating the oil from the acid sludge by mechanical separation.

No. 1,621,483, granted March 15, to Howard Dimmig, Chicago, assignor to The Texas Company, New York, for a stable soluble oil comprising mineral oil, sodium resinate and a phenol as a mutual solvent.

Semi - Portable Gasoline Plant Installed

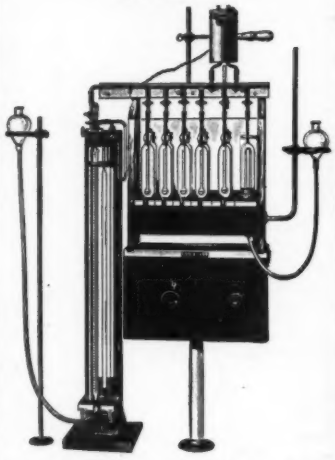
Los Angeles.—The O. C. Fields Gasoline Corporation operating a 15,000 gallon capacity absorption gasoline plant at Huntington Beach, has recently purchased a type 75 semi-portable Southwestern gasoline plant which is being installed as an addition to the older installation. Huntington Beach gas has a gasoline content of three gallons per thousand feet, with plenty of gas available due to the new developments in the townsite field.

BURRELL

De Luxe Safety Model

Standard-Burrell Gas Apparatus

For the Gas and Oil Industries



Completely Described in the New

BULLETIN NO. 750

A copy will be sent upon request.

Burrell Technical Supply Co.

CHEMICAL-BIOLOGICAL-METALLURGICAL LABORATORY APPARATUS AND REAGENTS

1704-1708 FIFTH AVENUE PITTSBURGH, PA.

CHEMICAL ENGINEER and REFINERY SUPERINTENDENT with over 22 years experience in European and American crude oils, specialist in Lub-oils and high vacuum distillation, desires change. Best references. Address Box 18, The Refiner and Natural Gasoline Manufacturer.

Electrically Driven Centrifuges
Hand Centrifuges
WRITE
WILLIAMS, BROWN & EARLE, Inc.
Manufacturers of Laboratory Apparatus
918 Chestnut St. Philadelphia, Pa.

BONER & SHELDON
Manufacturing Engineers
Fractionating Towers, Absorption Towers, Vertical Stills, Distillation Equipment.
514 Merchants National Bank Bldg.
Los Angeles, Cal.

GRADUATE ENGINEER experienced in oil refinery operation and construction. Must be first class man with good personality, initiative and ability to work harmoniously with other members of organization. Address Engineer, care Refiner & Natural Gasoline Manufacturer, Houston, Texas.

ADVERTISING INDEX

Allan & Co., George B. 126
American Car & Foundry Company ..... Front cover
American Cast Iron Pipe Company 93
American Cornice Works 117
American Paint & Supply Company 91
American Radiator Company 4
Association of Natural Gasoline Manufacturers 36
Andrews Bradshaw Company 114

Badger, E. B. & Sons, Company 44-45
Babcock & Wilcox Tube Company 127
Banner Rock Products Company 43
Biggs Boiler Works 23
Bessemer Gas Engine Company 6
Braun & Company, C. F. ..... Inside front cover
Bristol Company 112
Brown Instrument Company ..... Insert
Boner & Sheldon 128
Botfield Refractories Company 15
Buffalo Bronze Die Cast Corporation 113
Burrell Technical Supply Company 128

Campbell, J. A. 28
Clark Brothers Company 8-9
Cook Paint & Varnish Company 24
Conley Tank Car Company 124
Chestnut & Smith Corporation 41
Chaplin-Fulton Manufacturing Company 122
Chicago Bridge & Iron Works 10
Cooling Tower Company 106
Cooper Company, C. & G. 50
Crane Packing Company 128
Crosby Steam Gauge and Valve Company 130

Detroit Graphite Company 12

Edward Valve & Manufacturing Company 102
Electric Controller Manufacturing Company 20
Elliott Company 19

Fisher Governor Company 5
Foxboro Company, Inc. 117

Garlock Packing Company 129
Gasoline Recovery Corporation 40
General American Tank Car Corporation 115
Goulds Pumps, Inc. 113
Gray Processes Corporation 79
Great Northern Hotel 123
Greeve Brothers 81
Griscom-Russell Company 26
Goetze Gasket & Packing Company 121
Graver Corporation ..... Front cover
Gulf Publishing Company 121

Hammond Iron Works 46
Henderer's Sons Company, A. L. 125
Hill, Hubbell & Company 109
Hills-McCanna Company 30
Hope Engineering & Supply Company 22

International Compositions Company 127

Johns-Manville Corporation 7

Kaw Steel Construction Company 75
Kellogg Company, M. W. 32
Kerotest Manufacturing Company 48

Laclede-Christy Clay Products Company 29
Liberty Manufacturing Company 89
Lientz Oil Company, B. P. 71
Lummus, Walter E. Company 17

McDonald Manufacturing Company, A. Y. ..... Back cover
Metric Metal Works 13
Mettler Company, Lee B. 108
Metallastic, Inc. 130
Metallo Gasket Company 120
Metals Coating Company of America 37
Midwest Piping & Supply Company 77
Merco-Nordstrom Valve Company 25
Mine Safety Appliance Company 121

National Meter Company 125
National Transit Pump & Machine Company 73
Neilan, Schumacher & Company 3
National Airoil Burner Company 95
North American Car Corporation 109
Northern Equipment Company 27

Oakite Products Company 34
Oil Conservation Engineering Company 42

The Alchemy of Mechanical Packing

The Alchemist of old strove through the use of secret ingredients to produce gold from baser metal. He tried to make something of no value into an object of great value. We all know his efforts were in vain.

Alchemy has been practiced in the manufacture of Mechanical Packings. However, the test of time has proved that it is impossible to combine secret ingredients with baser structural substances and produce Mechanical Packings of true value.

ASBESTOS ROCK

CRUDE RUBBER

Garlock packings are Quality Controlled and made complete in our own factories from laboratory tested crude materials. In other words the consuming trade is furnished with a commodity of structural basic value, processed by the "Priceless Ingredient."

The "Priceless Ingredient" of every product is the honor and integrity of the manufacturer who makes it. Consider his name before you buy.

LABORATORY

GARLOCK

THE GARLOCK PACKING CO.

PALMYRA, NEW YORK

Sales Offices and Warehouses in All Principal Industrial Centers

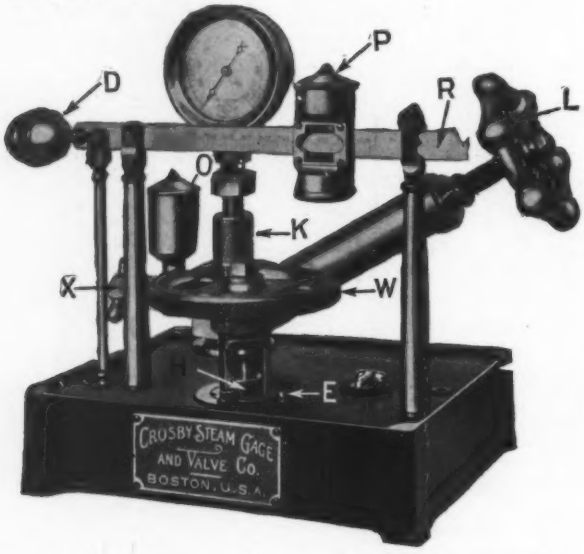
No Guess Work

with the new

CROSBY

GAGE TESTER

"The man on the job" operates it like an ordinary weighing scale.



The Crosby Gage Tester is always reliable because it eliminates the "human element" in testing high and low pressure gages. There are no weights to stack or rotate.

The pressure is read directly from a graduated scale in one pound steps.

The tester is compact and portable.

CROSBY

For 50 Years Manufacturers of

Safety and Relief Valves
Indicating and Recording Gages
Globe, Angle and Blow Off Valves
Manual and Electric Operated Whistles
Steam and Oil Engine Indicators

Write for further information.

Crosby Steam Gage & Valve Company
BOSTON, MASS.
NEW YORK CHICAGO LONDON

ADVERTISING INDEX Continued

Ohio Steel Foundry Company 18

Paige Jones Chemical Company 37
Pennsylvania Forge Company 11
Philbrico Jointless Firebrick Company ..... Inside back cover
Pittsburgh Steel Products Company 97
Power Piping Company 104
Power Plant Equipment Company 120
Power Specialty Company 107
Pulmosan Safety Equipment Company 122

Quigley Furnace Specialties Company 117

Refinery Supply Company 110
Ross Heater and Manufacturing Company 35
Roto Company, The 123

Sarco Company 108
Southwestern Engineering Corporation 71
Smith Separator Company 103
Southern Cornice Works 112
Schutte & Koerting Company 115
Smith Corporation, A. O. 67
Struthers-Wells Company 79
Sun Company 16

The Texas Company 14
Tulsa Boiler & Machine Works 101

United States Rubber Company 105
Universal Oil Products Company 38-39

Vilter Manufacturing Company 126
Vogt Machine Company, Henry 21

W-K-M Company, Inc. 43
Walworth Manufacturing Company 65
Walsh Fire Clay Products Company 119
Western Iron and Foundry Company 69
Wheeler Condenser and Engineering Company 30
Westcott & Greis 33
Winkler & Koch 87
Williams, Brown & Earle 128
Williams Valve Company, D. T. 81
Wyatt Metal and Boiler Works 85

York Manufacturing Company 119

Stuffing Box Troubles

Packing Stuffing Boxes with METALASTIC— Simple as loading your favorite pipe

METALASTIC fits any stuffing-box in your plant, and you don't have to look for sizes or cut and fit rings. There are no sizes and no rings. Pack any box in half the time.

One packing will serve for years because it is not necessary to remove **METALASTIC** to renew it.

Just add to what is already in the box without disturbing anything.

Order from your dealer or direct from the manufacturer.

METALASTIC INCORPORATED
JERSEY CITY, N. J.

METALASTIC

For All Stuffing Box Requirements

Patented and Patents Pending in United States and Foreign Countries

3 more for the Orient!

IN one of the Oriental countries across the Pacific, three Plibrico Diffusing Furnaces are in operation. And now three more are being built under Oriental stills.

The fame of the Diffusing Furance is traveling—even to the Far East. And in almost every refinery field in the United States, there is at least one installation.

The Diffusing Furnace brings some very definite economies, including the elimination of bottom buckling, the cutting of the time cycle, and the lowering of refractory maintenance cost.

The Plibrico engineering department will gladly prepare blue-prints showing how the Diffusing Furnace can be adapted to your new or existing oil or gas fired stills.

PLIBRICO JOINTLESS FIREBRICK CO.
1865 *Kingsbury Street, Chicago, Illinois*
Factories: Chicago and Trenton—Offices in 90 cities

The PLIBRICO Diffusing Furnace

132

Prevent evaporation,,,
Eliminate fire hazard,,
Save 2 to 8 barrels *per car*
Load 24 hours a day,
rain or shine ,,

with

UNIVERSAL

Gastite *Covers*

Universal Gastite Dome Cover patented Oct. 14, 1924.

"The Home of the Swing Joint"

A. Y. McDONALD MFG. CO.

Dubuque, Iowa

Omaha Minneapolis Des Moines Kansas City

There's a McDonald Distributor Near You